rev:B3

Number: AiP74HC/HCT595-AX-LJ-A026EN

AiP74HC/HCT595 8-bit Serial-in, Serial or Parallel-out Shift Register with Output Latches; 3-state

Product Specification

Specification Revision History:

Version	Date	Description
2012-06-A1	2012-06	New
2021-09-A2	2021-09	Modify Ordering Information
2021-12-A3	2021-12	Modify Ordering Information
2022-01-A4	2022-01	Modify ambient temperature to -40 °C ~+105 °C and add electrical
2022-01-A4	2022-01	characteristics of -40 °C ~+105 °C

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1. General Description

The AiP74HC/HCT595 is an 8-bit serial-in/serial or parallel-out shift register with a storage register and 3-state outputs. Both the shift and storage register have separate clocks. The device features a serial input (DS) and a serial output (Q7S) to enable cascading and an asynchronous reset MR input. A LOW on MR will reset the shift register. Data is shifted on the LOW-to-HIGH transitions of the SHCP input. The data in the shift register is transferred to the storage register on a LOW-to-HIGH transition of the STCP input. If both clocks are connected together, the shift register will always be one clock pulse ahead of the storage register. Data in the storage register appears at the output whenever the output enable input (OE) is LOW. A HIGH on OE causes the outputs to assume a high-impedance OFF-state. Operation of the OE input does not affect the state of the registers. Inputs include clamp diodes. This enables the use of current

Features:

- Input levels:
 - For AiP74HC595: CMOS level For AiP74HCT595: TTL level

limiting resistors to interface inputs to voltages in excess of V_{CC}.

- 8-bit serial input
- 8-bit serial or parallel output
- Storage register with 3-state outputs
- Shift register with direct clear
- 100 MHz (typical) shift out frequency
- Specified from -40°C to +105°C
- Packaging information: DIP16/SOP16/TSSOP16

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Ordering Information:

Tube packing specifications:

	Jechications:	I		D 1		T
Part number	Packaging form	Marking code	Tube quantity	Boxed tube quantity	Boxed quantity	Notes
AiP74HC595 DA16.TB	DIP16	74HC595	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HCT595 DA16.TB	DIP16	74HCT595	25 PCS/tube	40 tube/box	1000 PCS/box	Dimensions of plastic enclosure: 19.0mm×6.4mm Pin spacing: 2.54mm
AiP74HC595 SA16.TB	SOP16(1)	74HC595	50 PCS/tube	100 tube/box	5000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HC595 SA16.TB	SOP16(2)	74HC595	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HCT595 SA16.TB	SOP16	74HCT595	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing: 1.27mm
AiP74HC595 TA16.TB	TSSOP16(1)	74HC595	92 PCS/tube	100 tube/box	9200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HC595 TA16.TB	TSSOP16(2)	74HC595	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HC595 TA16.TB	TSSOP16(3)	74HC595	70 PCS/tube	140 tube/box	9800 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HC595 TA16.TB	TSSOP16(4)	74HC595	96 PCS/tube	140 tube/box	13440 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HC595 TA16.TB	TSSOP16(5)	74HC595	60 PCS/tube	120 tube/box	7200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HCT595 TA16.TB	TSSOP16(1)	74HCT595	96 PCS/tube	200 tube/box	19200 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm
AiP74HCT595 TA16.TB	TSSOP16(2)	74HCT595	50 PCS/tube	200 tube/box	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing: 0.65mm

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Reel packing specifications:

Part number	Packaging form	Marking code	Reel quantity	Boxed reel quantity	Notes
AiP74HC595SA16.TR	SOP16	74HC595	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HCT595SA16.TR	SOP16	74HCT595	4000 PCS/reel	8000 PCS/box	Dimensions of plastic enclosure: 10.0mm×3.9mm Pin spacing:1.27mm
AiP74HC595TA16.TR	TSSOP16	74HC595	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing:0.65mm
AiP74HCT595TA16.TR	TSSOP16	74HCT595	5000 PCS/reel	10000 PCS/box	Dimensions of plastic enclosure: 5.0mm×4.4mm Pin spacing:0.65mm

Note: If the physical information is inconsistent with the ordering information, please refer to the actual product.

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2. Block Diagram And Pin Description

2.1 Block Diagram

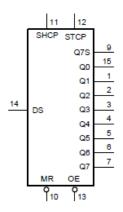


Figure 1. Logic symbol

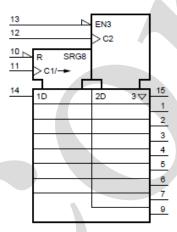


Figure 2. IEC logic symbol

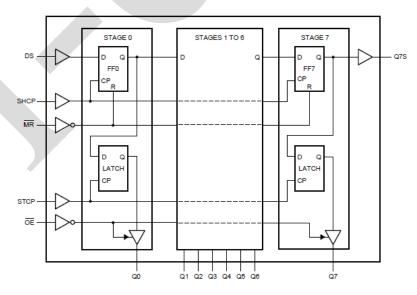


Figure 3. Logic diagram

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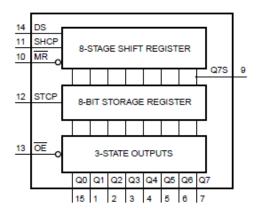
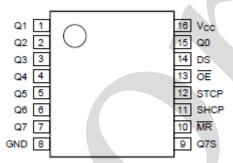


Figure 4. Functional diagram

2.2. Pin Configurations



2.3, Pin Description

Pin No.	Pin Name	Description
1	Q1	parallel data output
2	Q2	parallel data output
3	Q3	parallel data output
4	Q4	parallel data output
5	Q5	parallel data output
6	Q6	parallel data output
7	Q7	parallel data output
8	GND	ground (0V)
9	Q7S	serial data output
10	MR	master reset (active LOW)
11	SHCP	shift register clock input
12	STCP	storage register clock input
13	ŌĒ	output enable input (active LOW)
14	DS	serial data input
15	Q0	parallel data output
16	V_{CC}	supply voltage



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2.4 Function Table

	Con	trol		Input	Ou	tput	Function
SHCP	STCP	ŌE	MR	DS	Q7S	Qn	Function
X	X	L	L	X	L	NC	a LOW-level on MR only affects the shift registers
X	1	L	L	X	L	L	empty shift register loaded into storage register
X	X	Н	L	X	L	Z	shift register clear; parallel outputs in high-impedance OFF-state
↑	X	L	Н	Н	Q6S	NC	logic HIGH-level shifted into shift register stage 0. Contents of all shift register stages shifted through, e.g. previous state of stage 6 (internal Q6S) appears on the serial output (Q7S)
X	↑	L	Н	X	NC	QnS	contents of shift register stages (internal QnS) are transferred to the storage register and parallel output stages
↑	↑	L	Н	X	Q6S	QnS	contents of shift register shifted through; previous contents of the shift register is transferred to the storage register and the parallel output stages

Note: H=HIGH voltage level; L=LOW voltage level; Z=high-impedance OFF-state;

3. Electrical Parameter

3.1. Absolute Maximum Ratings

(Voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Co	onditions	Min.	Max.	Unit
supply voltage	V_{CC}		-	-0.5	+7.0	V
input clamping current	I_{IK}	$V_{\rm I}$ < -0.5V	or $V_I > V_{CC} + 0.5V$	-	±20	mA
output clamping current	I_{OK}	$V_{\rm O}$ < -0.5V	or $V_O > V_{CC} + 0.5V$	-	±20	mA
output ourrant	Ţ	$V_{O} = -0.5 V$ to	pin Q7S	-	±25	mA
output current	I_{O}	$(V_{CC}+0.5V)$	pins Qn	-	±35	mA
supply current	I_{CC}		-	-	70	mA
ground current	I_{GND}		-	-70	-	mA
storage temperature	T_{stg}		-	-65	+150	$^{\circ}$ C
total power dissipation	P _{tot}	-		-	500	mW
soldering temperature	T_{L}	10s	DIP	24	45	$^{\circ}$ C
solucing temperature	ı L	108	SOP	2:	50	$^{\circ}\mathbb{C}$

Note:

- [1] For DIP16 packages: above 70°C the value of P_{tot} derates linearly with 12mW/K.
- [2] For SOP16 packages: above 70 $^{\circ}\text{C}$ the value of P_{tot} derates linearly with 8mW/K.
- [3] For (T)SSOP16 packages: above 60°C the value of P_{tot} derates linearly with 5.5 mW/K.

^{↑=}LOW-to-HIGH transition; X=don't care; NC=no change.



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3.2, Recommended Operating Conditions

Parameter	Symbol	Conditions	Min.	Тур.	Max.	Unit
		AiP74HC595				
supply voltage	V_{CC}	-	2.0	5.0	6.0	V
input voltage	V_{I}	-	0	-	V_{CC}	V
output voltage	Vo	-	0	-	V_{CC}	V
		V _{CC} =2.0V	-	-	625	ns/V
input transition	$\Delta t/\Delta V$	V _{CC} =4.5V	-	1.67	139	ns/V
rise and fall rate		V _{CC} =6.0V	-	-	83	ns/V
ambient temperature	T_{amb}	-	-40	-	+105	$^{\circ}$
		AiP74HCT595				
supply voltage	V_{CC}	-	4.5	5.0	5.5	V
input voltage	$V_{\rm I}$	-	0	-	V_{CC}	V
output voltage	V_{O}	-	0	-	V_{CC}	V
input transition rise and fall rate	$\Delta t/\Delta V$	V _{CC} =4.5V	-	1.67	139	ns/V
ambient temperature	T_{amb}	-	-40	_	+105	$^{\circ}$

3.3 Electrical Characteristics

3.3.1, DC Characteristics 1

 $(T_{amb}=-40\,^{\circ}\text{C} \text{ to } +85\,^{\circ}\text{C}, \text{ voltages are referenced to GND (ground=0V), unless otherwise specified.)}$

Parameter	Symbol		Conditions	Min.	Тур.	Max.	Unit			
	AiP74HC595									
IIICII 1		$V_{CC}=2.0V$			1.2	-	V			
	V_{IH}		V _{CC} =4.5V	3.15	2.4	-	V			
input voltage			$V_{CC}=6.0V$	4.2	3.2	-	V			
LOWI		$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	0.5	V						
	V_{IL}		V _{CC} =4.5V	-	2.1	1.35	V			
HIGH-level input voltage V_{IH} LOW-level input voltage V_{IL} HIGH-level output voltage V_{OH}			V _{CC} =6.0V	-	2.8	1.8	V			
			1	1.9	2.0	-	V			
	$V_{ m OH}$	$V_{I} = V_{IH} \text{ or } V_{IL}$		4.4	4.5	-	V			
			1 '	5.9	6.0	-	V			
				3.84	4.32	-	V			
				5.34	5.81	-	V			
			_	3.84	4.32	1	V			
				5.34	5.81	-	V			
	V_{OL} $V_{I} = V_{IH}$ or V_{IL}	$V_{I} = V_{IH} \text{ or } V_{IL}$	1	-	0	0.1	V			
output voltage			all outputs;	-	0	0.1	V			

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			I _O =20uA; V _{CC} =4.5V						
			all outputs; I _O =20uA; V _{CC} =6.0V	_	0	0.1	V		
			Q7S output; I _O =4.0mA; V _{CC} =4.5V	-	0.15	0.33	V		
			Q7S output; I _O =5.2mA; V _{CC} =6.0V	-	0.16	0.33	V		
			Qn bus driver outputs; I _O =6.0mA; V _{CC} =4.5V	-	0.15	0.33	V		
			Qn bus driver outputs; I _O =7.8mA; V _{CC} =6.0V	-	0.16	0.33	V		
input leakage current	I_{I}	V _I =V _{CC} or	GND; V _{CC} =6.0V	-	1	±1.0	uA		
OFF-state output current	I_{OZ}		V_{IL} ; V_{CC} =6.0V; V_{CC} or GND	-	_	±5.0	uA		
supply current	I_{CC}	V _I =V _{CC} or GN	D; I _O =0A; V _{CC} =6.0V	-	-	80	uA		
input capacitance	C_{I}		-	-	3.5	-	pF		
	AiP74HCT595								
HIGH-level input voltage	V _{IH}	V _{CC} =4	4.5V to 5.5V	2.0	1.6	-	V		
LOW-level input voltage	$V_{\rm IL}$	V _{CC} =4	4.5V to 5.5V		1.2	0.8	V		
			all outputs; I _O =-20uA	4.4	4.5	-	V		
HIGH-level	V_{OH}	$V_{I} = V_{IH} \text{ or } V_{IL};$	Q7S output; I _O =-4.0mA	3.84	4.32	-	V		
output voltage	▼ OH	V _{CC} =4.5V	Qn bus driver outputs; I _O =-6.0mA	3.7	4.32	-	V		
			all outputs; I _O =20uA	-	0	0.1	V		
LOW-level	V_{OL}	$V_{I} = V_{IH} \text{ or } V_{IL};$	= V _{IH} or V _{IL} ; Q7S output; I _O =4.0mA		0.15	0.33	V		
output voltage	▼ OL	$V_{\rm CC}$ =4.5V	Qn bus driver outputs; I _O =6.0mA	-	0.16	0.33	V		
input leakage current	I_{I}	V _I =V _{CC} or	GND; V _{CC} =5.5V	-	-	±1.0	uA		
OFF-state output current	I_{OZ}		$V_{\rm IL}$; $V_{\rm CC}$ =5.5V; $V_{\rm CC}$ or GND	-	-	±5.0	uA		
supply current	I_{CC}		D; I _O =0A; V _{CC} =5.5V	-	-	80	uA		
additional		per input pin; V _I =V _{CC} -2.1V;	pins MR, SHCP, STCP, OE	-	150	675	uA		
supply current	ΔI_{CC}	other inputs at V_{CC} or GND; I_O =0A; V_{CC} =4.5V to 5.5V	pin DS	-	25	113	uA		
input capacitance	C _I		-	-	3.5	-	pF		



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3.3.2, DC Characteristics 2

 $(T_{amb}=-40\,^{\circ}\text{C} \text{ to } +105\,^{\circ}\text{C}, \text{ voltages are referenced to GND (ground=0V), unless otherwise specified.)}$

Parameter	Symbol	C	onditions	Min.	Typ.	Max.	Unit
		A	AiP74HC595				
IIICII I		7	V _{CC} =2.0V	1.5	-	-	V
HIGH-level input voltage	V_{IH}	7	V _{CC} =4.5V	3.15	-	-	V
input voitage		7	V _{CC} =6.0V	4.2	-	-	V
I OW level		V _{CC} =2.0V		-	-	0.5	V
LOW-level input voltage	$V_{ m IL}$	V	V _{CC} =4.5V	-	-	1.35	V
mput voitage		V	V _{CC} =6.0V	-	-	1.8	V
		_	all outputs; I _O =-20uA; V _{CC} =2.0V	1.9	-	-	V
		 -	all outputs; I _O =-20uA; V _{CC} =4.5V	4.4	-	-	V
THOU I			all outputs; I _O =-20uA; V _{CC} =6.0V	5.9	-	4	V
HIGH-level output voltage V _{OH}	V_{OH}	$V_{I} = V_{IH} \text{ or } V_{IL}$	Q7S output; I _O =-4.0mA; V _{CC} =4.5V	3.7	-	-	V
			Q7S output; I _O =-5.2mA; V _{CC} =6.0V	5.2	-	-	V
			Qn bus driver outputs; I_O =-6.0mA; V_{CC} =4.5V	3.7	-	-	V
			Qn bus driver outputs; I _O =-7.8mA; V _{CC} =6.0V	5.2	-	-	V
			all outputs; I _O =20uA; V _{CC} =2.0V	-	-	0.1	V
			all outputs; I _O =20uA; V _{CC} =4.5V	-	-	0.1	V
			all outputs; I _O =20uA; V _{CC} =6.0V	-	_	0.1	V
LOW-level output voltage	V _{OL}	$V_{I} = V_{IH} \text{ or } V_{IL}$	Q7S output; I _O =4.0mA; V _{CC} =4.5V	-	-	0.4	V
			Q7S output; $I_0=5.2$ mA; $V_{CC}=6.0$ V	-	-	0.4	V
			Qn bus driver outputs; I_0 =6.0mA; V_{CC} =4.5V	-	-	0.4	V
			Qn bus driver outputs; $I_0=7.8\text{mA}$; $V_{CC}=6.0\text{V}$	-	_	0.4	V
input leakage current	I _I	V _I =V _{CC} o	r GND; V _{CC} =6.0V	-	-	±1.0	uA
OFF-state output current	I_{OZ}		or V _{IL} ; V _{CC} =6.0V; EV _{CC} or GND	-	-	±10	uA
supply current	I_{CC}	V _I =V _{CC} or GN	ND; I _O =0A; V _{CC} =6.0V	-	-	160	uA
		A	iP74HCT595				
HIGH-level input voltage	V_{IH}	V _{CC} =	=4.5V to 5.5V	2.0	-	-	V
LOW-level input voltage	V_{IL}	V _{CC} =	-4.5V to 5.5V	-	-	0.8	V
HICH 11		V VV	all outputs; I _O =-20uA	4.4	_	-	V
HIGH-level output voltage	V_{OH}	$V_{I} = V_{IH} \text{ or } V_{IL};$ $V_{CC}=4.5V$	Q7S output; I _O =-4.0mA	3.7	-	-	V
Surput volunge		, ((= 1.5)	Qn bus driver outputs;	3.7	-	-	V

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			I _O =-6.0mA				
			all outputs; I _O =20uA	-	-	0.1	V
LOW-level	$V_{ m OL}$	$V_{I} = V_{IH} \text{ or } V_{IL};$	Q7S output; I _O =4.0mA	1	-	0.4	V
output voltage	V OL	V _{CC} =4.5V	Qn bus driver outputs; I _O =6.0mA	-	-	0.4	V
input leakage current	$I_{\rm I}$	V _I =V _{CC} or	$V_{I}=V_{CC}$ or GND; $V_{CC}=5.5V$			±1.0	uA
OFF-state output current	I_{OZ}		$V_{I}=V_{IH}$ or V_{IL} ; $V_{CC}=5.5V$; $V_{O}=V_{CC}$ or GND			±10	uA
supply current	I_{CC}	V _I =V _{CC} or GN	D; $I_0=0A$; $V_{CC}=5.5V$	1	-	160	uA
additional ΔI_{CC}	per input pin; V _I =V _{CC} -2.1V; other inputs at V _{CC}	pins MR, SHCP, STCP, OE	1	1	735	uA	
supply current	<u></u>	or GND; I_0 =0A; V_{CC} =4.5V to 5.5V	pin DS	-	-	123	uA

3.3.3 AC Characteristics 1

(T_{amb}=25 °C, voltages are referenced to GND (ground=0V), unless otherwise specified.)

Parameter	Symbol	Cor	nditions	Min.	Тур.	Max.	Unit
		Ail	P74HC595				
		GLICD . OZG	V _{CC} =2.0V		> 52	160	ns
		SHCP to Q7S; see Figure 6	V _{CC} =4.5V	-	19	32	ns
propagation	4	see Figure 0	V _{CC} =6.0V	-	15	27	ns
delay	$t_{ m pd}$	CTCD to One	$V_{CC}=2.0V$	-	55	175	ns
		STCP to Qn; see Figure 7	V _{CC} =4.5V	-	20	35	ns
		see Figure 7	V _{CC} =6.0V	-	16	30	ns
HIGH to LOW			$V_{CC}=2.0V$	-	47	175	ns
propagation	t_{PHL}	MR to Q7S; see Figure 9	$V_{CC}=4.5V$	-	17	35	ns
delay		see Figure 9	V _{CC} =6.0V	-	14	30	ns
			$V_{CC}=2.0V$	-	47	150	ns
OE to Qn enable time	t_{en}	see Figure 10	V _{CC} =4.5V	-	17	30	ns
enable time			V _{CC} =6.0V	-	14	26	ns
		see Figure 10	$V_{CC}=2.0V$	-	41	150	ns
OE to Qn disable time	t_{dis}		V _{CC} =4.5V	-	15	30	ns
disable time			$V_{CC}=6.0V$	-	12	27	ns
		SHCP HIGH or	$V_{CC}=2.0V$	75	17	160 32 27 175 35 30 175 35 30 150 30 26 150 30	ns
		LOW;	V _{CC} =4.5V	15	19 3 15 2 55 1' 20 3 16 3 47 1' 17 3 14 3 47 1: 17 3 14 2 41 1: 15 3 12 2 5 17 6 6 8 8 5 11 6 8 3 17 6 6 6 8 5 11 6 8 3 17 6 6 6 8 5	-	ns
		see Figure 6	V _{CC} =6.0V	13	5	160 32 27 175 35 30 175 35 30 150 30 26 150 30 27 - - - - - - -	ns
		STCP HIGH or	$V_{CC}=2.0V$	75	11	-	ns
pulse width	$t_{ m W}$	LOW;	V _{CC} =4.5V	15	4	-	ns
		see Figure 7	$V_{CC}=6.0V$	13	3	-	ns
			V _{CC} =2.0V	75	17	-	ns
		MR LOW; see Figure 9	V _{CC} =4.5V	15	6	-	ns
		see Figure 9	V _{CC} =6.0V	13	5	-	ns
		DS to SHCP;	V _{CC} =2.0V	50	11	-	ns
set-up time	t_{su}	see Figure 8	V _{CC} =4.5V	10		-	ns
		300 1 15410 0	V _{CC} =6.0V	9	3	-	ns

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			- 1 - 1 - 1	- ,,			
		GLICD (GECD	$V_{CC}=2.0V$	75	22	-	ns
		SHCP to STCP; see Figure 7	V _{CC} =4.5V	15	8	-	ns
		$V_{CC}=6.0V$		13	7	-	ns
Day GHCD			$V_{CC}=2.0V$	3	-6	-	ns
DS to SHCP hold time	t_h	see Figure 8	$V_{CC}=4.5V$	3	-2	-	ns
noid time			$V_{CC}=6.0V$	3	-2	-	ns
			$V_{CC}=2.0V$	50	-19	-	ns
MR to SHCP recovery time	t_{rec}	see Figure 9	$V_{CC}=4.5V$	10	-7	-	ns
recovery time			$V_{CC}=6.0V$	9	-6	-	ns
maximum		SHCP or STCP;	$V_{CC}=2.0V$	9	30	-	MHz
frequency	f_{max}	see Figure 6	$V_{CC}=4.5V$	30	91	-	MHz
rrequeriey		and Figure 7	$V_{CC}=6.0V$	35	108	-	MHz
power dissipation capacitance	C_{PD}	all 9 outputs sw V _I =GN	-	115	-	pF	
		AiP74HCT59	5; V _{CC} =4.5V to 5.5V				
propagation		SHCP to Q7	-	25	42	ns	
delay	$t_{ m pd}$	STCP to Q	-	24	40	ns	
HIGH to LOW propagation delay	t _{PHL}	MR to Q7	ı	23	40	ns	
OE to Qn enable time	t _{en}	see F	figure 10	-	21	35	ns
OE to Qn disable time	t _{dis}	see F	figure 10	-	18	30	ns
		SHCP HIGH or	LOW; see Figure 6	16	6	-	ns
pulse width	$t_{ m W}$	STCP HIGH or	LOW; see Figure 7	16	5	-	ns
		MR LOW	; see Figure 9	20	8	-	ns
set-up time	+	DS to SHC	P; see Figure 8	16	5	-	ns
	t_{su}	SHCP to STO	CP; see Figure 7	16	8	-	ns
DS to SHCP hold time	t _h	see I	Figure 8	3	-2	-	ns
MR to SHCP recovery time	t_{rec}	see I	10	-7	-	ns	
maximum frequency	f_{max}	SHCP or STCP; see	e Figure 6 and Figure 7	30	52	-	MHz
power dissipation capacitance	C_{PD}		vitching; $f_i=1MHz$; to $V_{CC}-1.5V$	-	130	-	pF

Note:

[1] Typical values are measured at nominal supply voltage.

- [2] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [3] t_{en} is the same as t_{PZL} and t_{PZH} .
- [4] t_{dis} is the same as t_{PLZ} and t_{PHZ} .
- [5] C_{PD} is used to determine the dynamic power dissipation (P_D in uW).

 $P_D = C_{PD} \times V_{CC}^2 \times f_i + \sum (C_L \times V_{CC}^2 \times f_o)$ where:

f_i=input frequency in MHz;



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f_o=output frequency in MHz;

C_L=output load capacitance in pF;

V_{CC}=supply voltage in V;

 $\sum (C_L \times V_{CC}^2 \times f_o) = \text{sum of outputs.}$

3.3.4、AC Characteristics 2

 $(T_{amb}=-40\,^{\circ}\text{C} \text{ to } +85\,^{\circ}\text{C}, \text{ voltages are referenced to GND (ground=0V), unless otherwise specified.)}$

Parameter	Symbol	Con	ditions	Min.	Typ.	Max.	Unit
		AiP	74HC595		•		
		GYYGD . GEG	V _{CC} =2.0V	-	-	200	ns
		SHCP to Q7S; see Figure 6	V _{CC} =4.5V	_	-	40	ns
propagation	4	see Figure 0	V _{CC} =6.0V	-	-	34	ns
delay	t_{pd}	CTECTD O	V _{CC} =2.0V		-	220	ns
		STCP to Qn; see Figure 7	V _{CC} =4.5V	-	-	44	ns
		see Figure 7	$V_{CC}=6.0V$	-		37	ns
HIGH to LOW			$V_{CC}=2.0V$	-	' '	220	ns
propagation	t_{PHL}	MR to Q7S;	$V_{CC}=4.5V$	-	-	44	ns
delay		see Figure 9	V _{CC} =6.0V	-	-	37	ns
			$V_{CC}=2.0V$,	-	190	ns
OE to Qn	t_{en}	see Figure 10	$V_{CC}=4.5V$	-	-	38	ns
enable time			$V_{CC}=6.0V$	-	-	33	ns
			$V_{CC}=2.0V$	-	-	190	ns
OE to Qn disable time	$t_{ m dis}$	see Figure 10	V _{CC} =4.5V	-	-	38	ns
			$V_{CC}=6.0V$	-	-	33	ns
		SHCP HIGH or LOW; see Figure 6	$V_{CC}=2.0V$	95	-	-	ns
	t _W		V _{CC} =4.5V	19	-	-	ns
			V _{CC} =6.0V	16	-	-	ns
		STCP HIGH or	V _{CC} =2.0V	95	-	-	ns
pulse width		LOW;	V _{CC} =4.5V	19	-	-	ns
		see Figure 7	$V_{CC}=6.0V$	16	-	-	ns
		_	$V_{CC}=2.0V$	95	-	-	ns
		MR LOW;	$V_{CC}=4.5V$	19	-	-	ns
		see Figure 9	$V_{CC}=6.0V$	16	-	-	ns
		Da Carlob	$V_{CC}=2.0V$	65	-	-	ns
		DS to SHCP; see Figure 8	$V_{CC}=4.5V$	13	-	-	ns
sot un timo		see rigure o	$V_{CC}=6.0V$	11	-	-	ns
set-up time	t_{su}	CHCD 4- CTCD.	$V_{CC}=2.0V$	95	-	-	ns
		SHCP to STCP; see Figure 7	$V_{CC}=4.5V$	19	-	-	ns
		see Figure 7	$V_{CC}=6.0V$	16	-	-	ns
DC to CHCD			$V_{CC}=2.0V$	3	-	-	ns
DS to SHCP hold time	t_h	see Figure 8	$V_{CC}=4.5V$	3	-	-	ns
noid time			V _{CC} =6.0V	3	-	-	ns
			V _{CC} =2.0V	65	-	-	ns
MR to SHCP	t_{rec}	see Figure 9	$V_{CC}=4.5V$	13	-	-	ns
recovery time			$V_{CC}=6.0V$	11	_	-	ns

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	f_{max}	SHCP or STCP;	$V_{CC}=2.0V$	4.8	-	-	MHz
maximum frequency		see Figure 6	$V_{CC}=4.5V$	24	-	-	MHz
requericy		and Figure 7	$V_{CC}=6.0V$	28	-	-	MHz
propagation	+	SHCP to Q7	7S; see Figure 6	-	-	53	ns
delay	$t_{ m pd}$	STCP to Q	n; see Figure 7	-	-	50	ns
HIGH to LOW propagation delay	t _{PHL}	MR to Q7	MR to Q7S; see Figure 9				ns
OE to Qn enable time	t _{en}	see F	-	-	44	ns	
OE to Qn disable time	$t_{ m dis}$	see F	-	-	38	ns	
	$t_{ m W}$	SHCP HIGH or	20	-	- /	ns	
pulse width		STCP HIGH or	20	-	-	ns	
		MR LOW	25	-	-	ns	
got un timo	+	DS to SHC	20	-	-	ns	
set-up time	t_{su}	SHCP to ST	CP; see Figure 7	20	-	-	ns
DS to SHCP hold time	t_h	see l	Figure 8	3	-	-	ns
MR to SHCP recovery time	t_{rec}	see l	13	-	-	ns	
maximum frequency	f_{max}	SHCP or STCP; see	e Figure 6 and Figure 7	24	-	-	MHz

Note:

- [1] Typical values are measured at nominal supply voltage.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [3] t_{en} is the same as t_{PZL} and t_{PZH} .
- [4] t_{dis} is the same as t_{PLZ} and t_{PHZ} .

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3.3.5, AC Characteristics 3

 $(T_{amb}=-40\,^{\circ}\text{C} \text{ to } +105\,^{\circ}\text{C}, \text{ voltages are referenced to GND (ground=0V), unless otherwise specified.)}$

Parameter	Symbol	Con	ditions	Min.	Тур.	Max.	Unit		
		AiP	74HC595						
		SHCD to OZG.	$V_{CC}=2.0V$	-	1	240	ns		
		SHCP to Q7S; see Figure 6	$V_{CC}=4.5V$	-	-	48	ns		
propagation delay	4	see Figure 0	V _{CC} =6.0V	-	-	41	ns		
	t_{pd}	aman	V _{CC} =2.0V	-	-	265	ns		
		STCP to Qn; see Figure 7	V _{CC} =4.5V	-	-	53	ns		
		see Figure 7	V _{CC} =6.0V	-	-	45	ns		
HIGH to LOW		_	V _{CC} =2.0V	-	-	265	ns		
propagation	t_{PHL}	MR to Q7S;	V _{CC} =4.5V	7-	-	53	ns		
delay		see Figure 9	V _{CC} =6.0V	-	-	45	ns		
_			V _{CC} =2.0V	-	-	225	ns		
OE to Qn	t _{en}	see Figure 10	V _{CC} =4.5V	-	,	45	ns		
enable time		_	V _{CC} =6.0V	-	-	38	ns		
_			V _{CC} =2.0V	-	-	225	ns		
OE to Qn	$t_{ m dis}$	see Figure 10	V _{CC} =4.5V	-	-	45	ns		
disable time		C	V _{CC} =6.0V	-	-	38	ns		
pulse width		SHCP HIGH or	V _{CC} =2.0V	110	-	-	ns		
		LOW;	V _{CC} =4.5V	22	-	-	ns		
		see Figure 6	V _{CC} =6.0V	19	_	-	ns		
		STCP HIGH or	V _{CC} =2.0V	110	_	-	ns		
	$t_{ m W}$	LOW;	V _{CC} =4.5V	22	_	_	ns		
		see Figure 7	V _{CC} =6.0V	19	_	-	ns		
			V _{CC} =2.0V	110	_	-	ns		
		MR LOW;	V _{CC} =4.5V	22	_	_	ns		
		see Figure 9	V _{CC} =6.0V	19	_	_	ns		
			V _{CC} =2.0V	75	_	_	ns		
	t _{su}	DS to SHCP;	V _{CC} =4.5V	15	_	_	ns		
		see Figure 8	V _{CC} =6.0V	13	_	_	ns		
set-up time			V _{CC} =2.0V	110	_	_	ns		
		SHCP to STCP;	V _{CC} =4.5V	22	_	_	ns		
		see Figure 7	$V_{CC}=6.0V$	19	_	_	ns		
			V _{CC} =2.0V	3	_	_	ns		
DS to SHCP	$t_{\rm h}$	see Figure 8	V _{CC} =4.5V	3	_	_	ns		
hold time	-11	300 1 18010 0	$V_{\rm CC}$ =6.0V	3	_	_	ns		
			V _{CC} =2.0V	75	_	_	ns		
MR to SHCP	$t_{\rm rec}$	see Figure 9	V _{CC} =4.5V	15	_	_	ns		
recovery time	rec	see Hgare y	V _{CC} =6.0V	13	_	_	ns		
		CUCD on CTCD.	$V_{CC}=0.0V$	4	_	_	MHz		
maximum	f	SHCP or STCP; see Figure 6	$V_{\rm CC}$ =4.5V	20	_	_	MHz		
frequency	f_{max}	and Figure 7	$V_{\rm CC}=6.0V$	24	_	_	MHz		
			5; V _{CC} =4.5V to 5.5V	4٦	_	_	171117		
nnonosstian	4					62	***		
propagation t_{pd} SHCP to Q7S; see Figure 6 - 63 ns									

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delay		STCP to Qn; see Figure 7	-	-	60	ns
HIGH to LOW propagation delay	$t_{ m PHL}$	MR to Q7S; see Figure 9	-	-	60	ns
OE to Qn enable time	t_{en}	see Figure 10	ı	-	53	ns
OE to Qn disable time	$t_{ m dis}$	see Figure 10	-	-	45	ns
		SHCP HIGH or LOW; see Figure 6	24	-	-	ns
pulse width	t_{W}	STCP HIGH or LOW; see Figure 7	24	-	-	ns
		MR LOW; see Figure 9	30	-	-	ns
sat un tima	+	DS to SHCP; see Figure 8	24	-	1	ns
set-up time	t_{su}	SHCP to STCP; see Figure 7	24	-	-	ns
DS to SHCP hold time	t_h	see Figure 8	3	-	-	ns
MR to SHCP recovery time	t_{rec}	see Figure 9	15	-	-	ns
maximum frequency	f_{max}	SHCP or STCP; see Figure 6 and Figure 7	20	-	-	MHz

Note:

- [1] Typical values are measured at nominal supply voltage.
- [2] t_{pd} is the same as t_{PLH} and t_{PHL} .
- [3] t_{en} is the same as t_{PZL} and t_{PZH} .
- [4] t_{dis} is the same as t_{PLZ} and t_{PHZ} .

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4. Testing Circuit

4.1, AC Testing Circuit

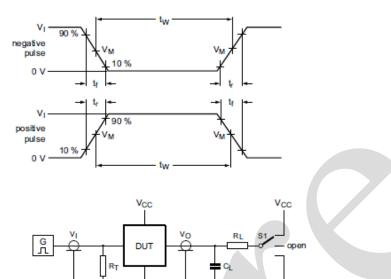


Figure 5. Test circuit for measuring switching times

Definitions for test circuit:

R_L=Load resistance.

C_L=Load capacitance including jig and probe capacitance.

 R_T =Termination resistance should be equal to the output impedance Z_o of the pulse generator.

S1=Test selection switch.

4.2, AC Testing Waveforms

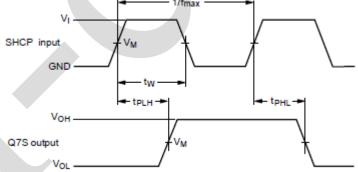


Figure 6. Shift clock pulse, maximum frequency and input to output propagation delays

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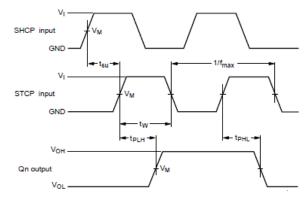


Figure 7. Storage clock to output propagation delays

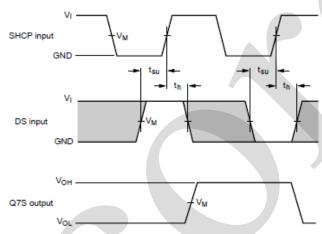


Figure 8. Data set-up and hold times

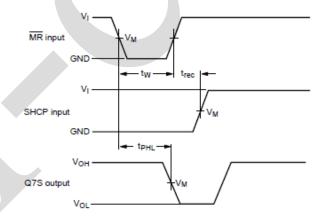


Figure 9. Master reset to output propagation delays





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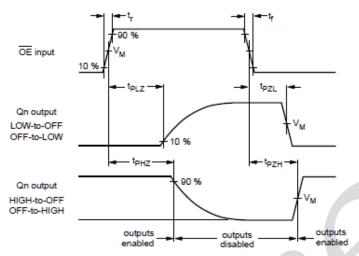


Figure 10. Enable and disable times

4.3, Measurement Points

Туре	Input	Output
Турс	$\mathbf{V}_{\mathbf{M}}$	$\mathbf{V}_{\mathbf{M}}$
AiP74HC595	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
AiP74HCT595	1.3V	1.3V

4.4, Test Data

	Input		Load		S1 position		
Type	3 7	4 4	C	D	t _{PHL} ,	t _{PZH} ,	$t_{\mathrm{PZL},}$
	VI	t_r , t_f	$C_{ m L}$	R_{L}	$t_{\rm PLH}$	t_{PHZ}	t_{PLZ}
AiP74HC595	V _{CC}	6ns	50pF	1kΩ	open	GND	V_{CC}
AiP74HCT595	3V	6ns	50pF	1kΩ	open	GND	V_{CC}

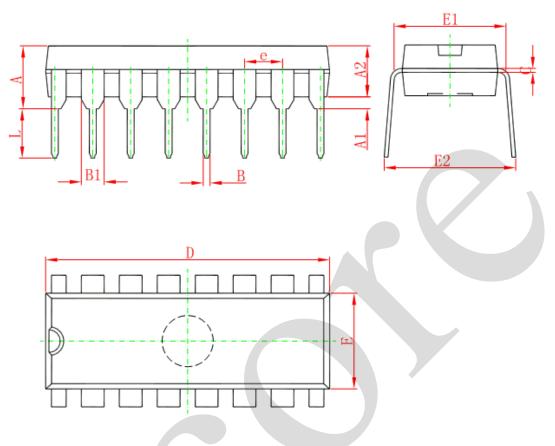
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5. Package Information

5.1、DIP16



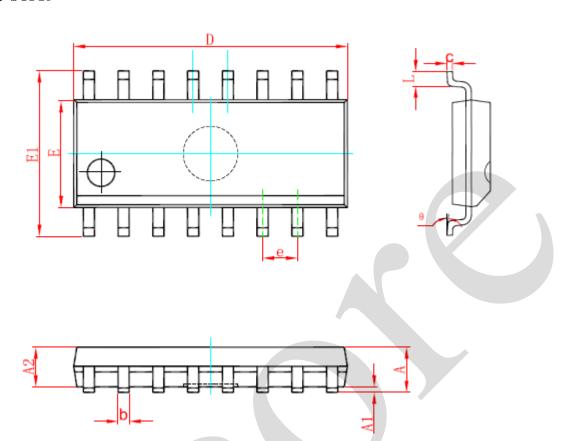
Comb of	Dimensions I	n Millimeters	Dimensions	In Inches
Symbol	Min	Max	Min	Max
A	3. 710	4. 310	0.146	0. 170
A1	0. 510		0.020	
A2	3. 200	3.600	0. 126	0.142
В	0. 380	0.570	0.015	0.022
B1	1. 524	(BSC)	0.060 (BSC)	
С	0. 204	0.360	0.008	0.014
D	18. 800	19. 200	0.740	0.756
Е	6. 200	6.600	0. 244	0. 260
E1	7. 320	7. 920	0. 288	0.312
е	2. 540	(BSC)	0. 100	(BSC)
L	3. 000	3.600	0. 118	0.142
E2	8. 400	9.000	0.331	0.354

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5.2, SOP16



0 1 1	Dimensions In	n Millimeters	Dimensions In Inches		
Symbol	Min	Max	Min	Max	
A	1. 350	1. 750	0. 053	0.069	
A1	0. 100	0. 250	0.004	0. 010	
A2	1. 350	1.550	0. 053	0. 061	
Ь	0. 330	0. 510	0. 013	0. 020	
С	0. 170	0. 250	0.007	0. 010	
D	9. 800	10. 200	0. 386	0. 402	
E	3. 800	4. 000	0. 150	0. 157	
E1	5. 800	6. 200	0. 228	0. 244	
е	1. 270 (BSC)		0.050	(BSC)	
L	0. 400	1. 270	0. 016	0. 050	
θ	0°	8°	0°	8°	

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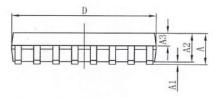
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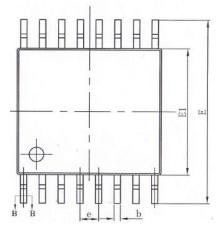


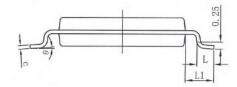
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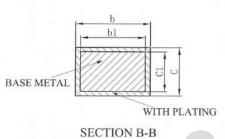
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5.3、TSSOP16









SYMBOL	M	ILLIMET	ER
SYMBOL	MIN	NOM	MAX
A	_	_	1.20
Al	0.05	_	0.15
A2	0.90	1.00	1.05
A3	0.39	0.44	0.49
b	0.20	_	0.28
bl	0.19	0.22	0.25
c	0.13	_	0.17
c1	0.12	0.13	0.14
D	4.90	5.00	5.10
Е	6.20	6.40	6.60
E1	4.30	4.40	4.50
e		0.65BSC	
L	0.45	0.60	0.75
LI		1.00BSC	7
0	0		8°



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6. Statements And Notes

6.1. The name and content of Hazardous substances or Elements in the product

				Hazard	ous substar	nces or Ele	ments				
Part name	Lead and lead compou nds	Mercur y and mercur y compo unds	Cadm ium and cadmi um comp ounds	Hexaval ent chromiu m compoun ds	Polybro minated biphenyl s	Polybro minate d biphen yl ethers	Dibutyl phthala te	Butylbe nzyl phthala te	Di-2-et hylhex yl phthala te	Diisobu tyl phthala te	
Lead frame	0	0	0	0	0	0	0	0	0	0	
Plastic resin	0	0	0	0	0	0	0	0	0	0	
Chip	0	0	0	0	0	0	0	0	0	0	
The lead	0	0	0	0	0	0	0	0	0	0	
Plastic sheet installed	0	0	0	0	0	0	0	0	0	0	
explanation	o: Indicates that the content of hazardous substances or elements in the detection limit of the following the SI/T11363-2006 standard										

6.2, Notion

Recommended carefully reading this information before the use of this product;

The information in this document are subject to change without notice;

This information is using to the reference only, the company is not responsible for any loss;

The company is not responsible for the any infringement of the third party patents or other rights of the responsibility.

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