

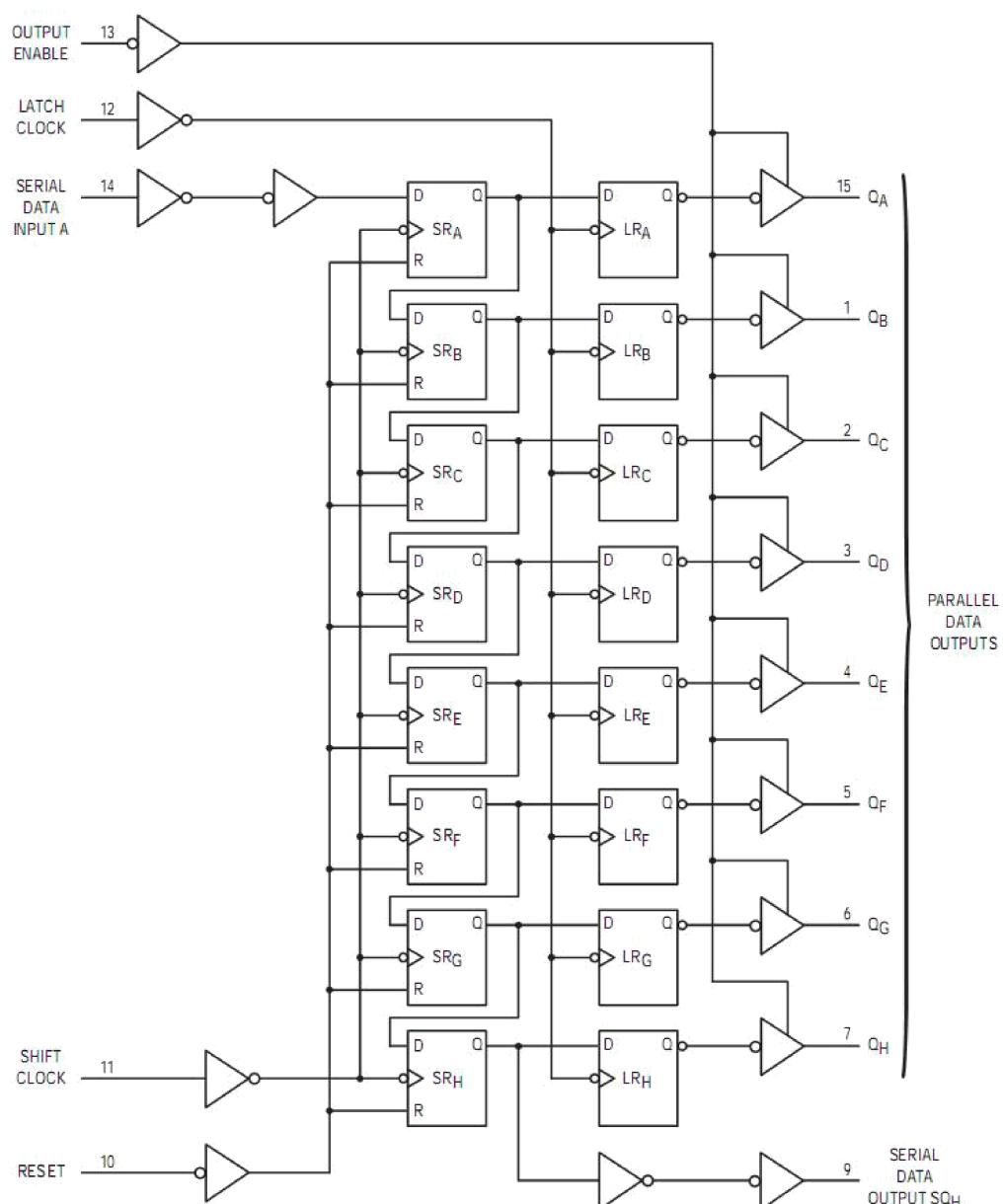
## Characterization

TM74HC595 is an open-drain output CMOS shift register which is designed with controllable tri-state output terminals and, when in serial output configuration, can control cascade chip of next stage. This product is excellent in performance and reliable in quality.

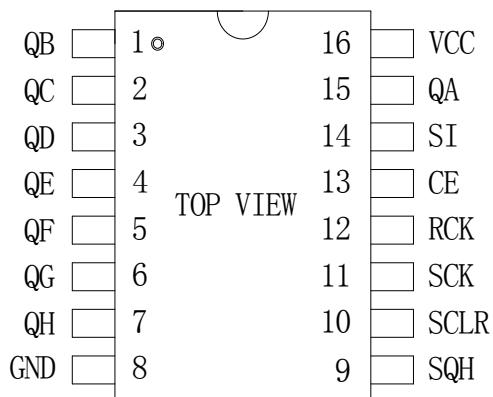
## Features

- High-speed shift clock frequency  $F_{max} > 25\text{MHz}$
- Standard SPI
- CMOS serial output, capable of cascading multiple devices
- Low power consumption:  $I_{cc} = 4\mu\text{A}$  (MAX) when  $TA = 25^\circ\text{C}$

## Block diagram of internal structure



## Pin arrangement

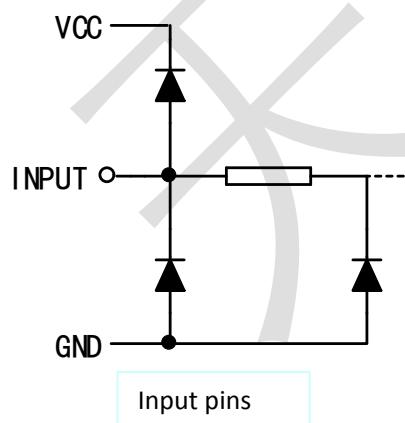


TM74HC595

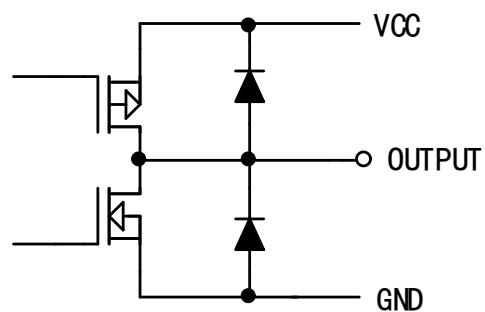
## Pin Function

Pin Name	Pin No.	Function Description
QA—QH	15, 1, 2, 3, 4, 5, 6, 7	Tri-state output pin
GND	8	Negative power
SQH	9	Serial data output pin
SCLR	10	Clear pin of shift register
SCK	11	Input pin of data shift clock
RCK	12	Input pin of Latch clock
OE	13	Output enable pin
SI	14	Input pin of serial data
VCC	16	Positive power

## Input and output equivalent circuit



Input pins



Output pins

**ESD protection**

An integrated circuit is a static sensitive device. Since a considerable amount of static electricity is likely to be generated in a dry season or a dry environment and electrostatic discharge will damage integrated circuits, it is the advise of Titan that preventive measures should be taken for all appropriate ICs are. Improper operation and welding may cause ESD damage or performance degradation, and put the chip out of service.



## Recommended Operating Conditions

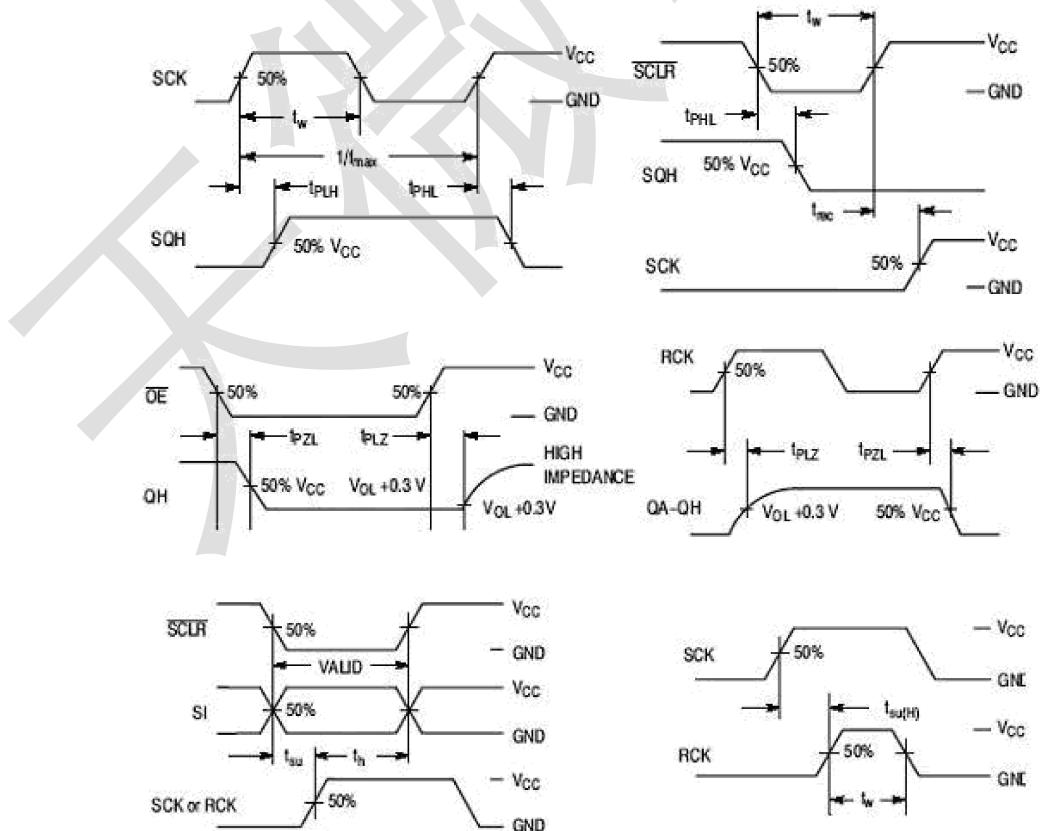
Tested at -45 °C ~ + 85 °C , unless otherwise stated		TM74HC595			Unit
Parameter Name	Parameter Symbol	Test Conditions	Minimum	Maximum	
DC VDD	V <sub>CC</sub>		2.0	5.5	V
DC input voltage	V <sub>IN</sub>		0	5.5	V
DC output voltage	V <sub>OUT</sub>		0	V <sub>CC</sub>	V
Operating temperature	T <sub>A</sub>	V <sub>CC</sub> = 5V	-55	125	°C

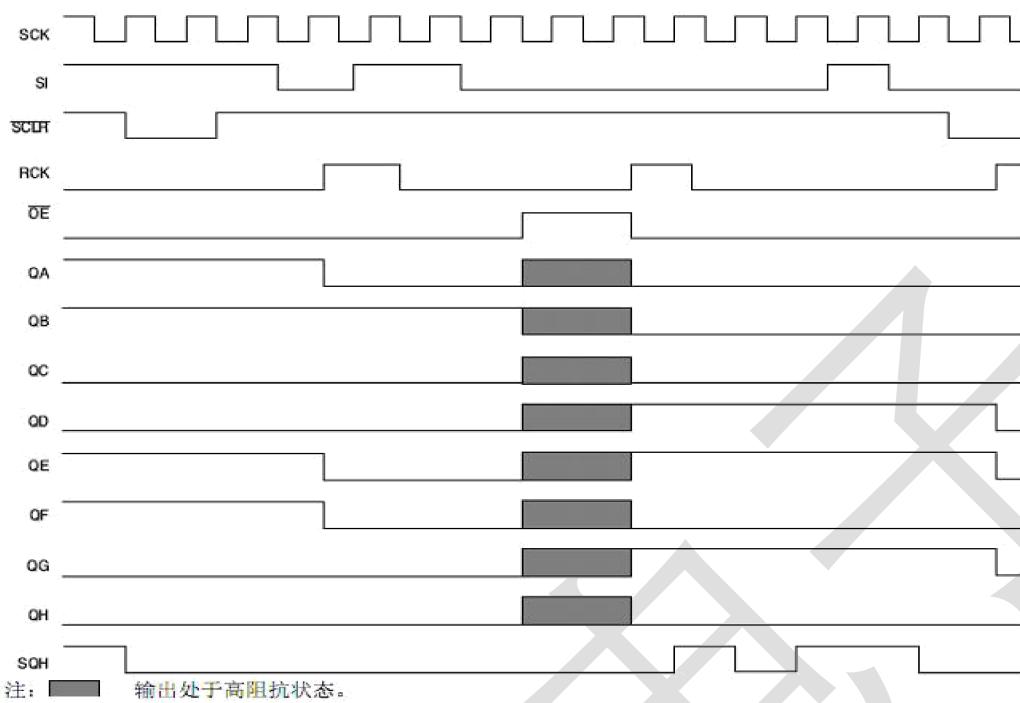
## Electrical Characteristics

Unless otherwise stated, tested at VDD = 3.0V ~ 5.5V and the operating temperature of -40 °C ~ + 85 °C			TM74HC595						Unit				
Parameter Name	Parameter Symbol	Test Conditions		Value									
		VDD		25°C			-40°C—85 °C		-55°C—125 °C				
Input high level	V <sub>IH</sub>			Min	Typ	Max	Min	Max	Min	Max			
	2.0		1.46			1.46		1.46		V			
	4.5		3.23			3.23		3.23					
Input low level	V <sub>IL</sub>	6.0		4.30			4.30		4.30				
		2.0			0.52		0.52		0.52		V		
		4.5			1.32		1.32		1.32				
Output high level (SQH)	V <sub>OH</sub>	6.0			1.77		1.77		1.77		V		
		2.0		1.9	2.0		1.9		1.9				
		4.5		4.4	4.5		4.4		4.4				
		6.0		5.9	6.0		5.9		5.9				
		4.5		I <sub>O</sub> =-4.0mA	4.18	4.31		4.13		4.10			
Output high level (QA-QH)	V <sub>OH</sub>	6.0		I <sub>O</sub> =-5.2mA	5.68	5.8		5.63		5.60		V	
		2.0		I <sub>O</sub> =-20μA	1.9	2.0		1.9		1.9			
		4.5		I <sub>O</sub> =-20μA	4.4	4.5		4.4		4.4			
		6.0		I <sub>O</sub> =-20μA	5.9	6.0		5.9		5.9			
		4.5		I <sub>O</sub> =-6.0mA	4.18	4.31		4.13		4.10			
Output low level (SQH)	V <sub>OL</sub>	6.0		I <sub>O</sub> =-7.8mA	5.68	5.8		5.63		5.60		V	
		2.0		I <sub>O</sub> =20μA	0.0	0.1		0.1		0.1			
		4.5		I <sub>O</sub> =20μA	0.0	0.1		0.1		0.1			
		6.0		I <sub>O</sub> =20μA	0.0	0.1		0.1		0.1			
		4.5		I <sub>O</sub> =4.0mA		0.17	0.26		0.33		0.40		
Output low level (QA-QH)	V <sub>OL</sub>	6.0		I <sub>O</sub> =5.2mA		0.18	0.26		0.33		0.40		V
		2.0		I <sub>O</sub> =20μA	0.0	0.1		0.1		0.1			
		4.5		I <sub>O</sub> =20μA	0.0	0.1		0.1		0.1			
		6.0		I <sub>O</sub> =20μA	0.0	0.1		0.1		0.1			
		4.5		I <sub>O</sub> =6.0mA		0.17	0.26		0.33		0.40		
Quiescent Current	I <sub>CC</sub>	6.0	V <sub>I</sub> =V <sub>CC</sub> or GND				4		40		80	μA	

**Switching characteristics**

Unless otherwise stated, tested at $VDD = 3.0V \sim 5.5V$ and the operating temperature of $-40^{\circ}C \sim +85^{\circ}C$			<b>TM74HC595</b>			<b>Unit</b>
<b>Parameter Name</b>	<b>Para mete r Sym bol</b>	<b>Test Condi tions</b>	$T_A=25^{\circ}C$	$T_A=-40 \sim 85^{\circ}C$	$T_A=-55 \sim 125^{\circ}C$	
			<b>Range</b>	<b>Range</b>	<b>Range</b>	
SI-to-SCK ON time	$t_{su}$	$VDD=3.3$ $VDD=5.0$	3.5 3.0	3.5 3.0	3.5 3.0	ns
SCK-to-RCK ON time	$t_{su(H)}$	$VDD=3.3$ $VDD=5.0$	8.0 5.0	8.5 5.0	8.5 5.0	ns
SCLR-to-RCK ON time	$t_{su(L)}$	$VDD=3.3$ $VDD=5.0$	9.0 5.0	9.0 5.0	9.0 5.0	ns
SI-to-SCK OFF time	$t_h$	$VDD=3.3$ $VDD=5.0$	1.5 2.0	1.5 2.0	1.5 2.0	ns
SCLR-to-RCK OFF time	$t_{h(L)}$	$VDD=3.3$ $VDD=5.0$	0 0	0 0	1.0 1.0	ns
SCLR-to-SCK recovery time	$t_{rec}$	$VDD=3.3$ $VDD=5.0$	3.0 2.5	3.0 2.5	3.0 2.5	ns
Pulse width of SCK or RCK	$t_w$	$VDD=3.3$ $VDD=5.0$	5.0 5.0	5.0 5.0	5.0 5.0	ns
SCLR pulse width	$t_{w(L)}$	$VDD=3.3$ $VDD=5.0$	5.0 5.0	5.0 5.0	5.0 5.0	ns

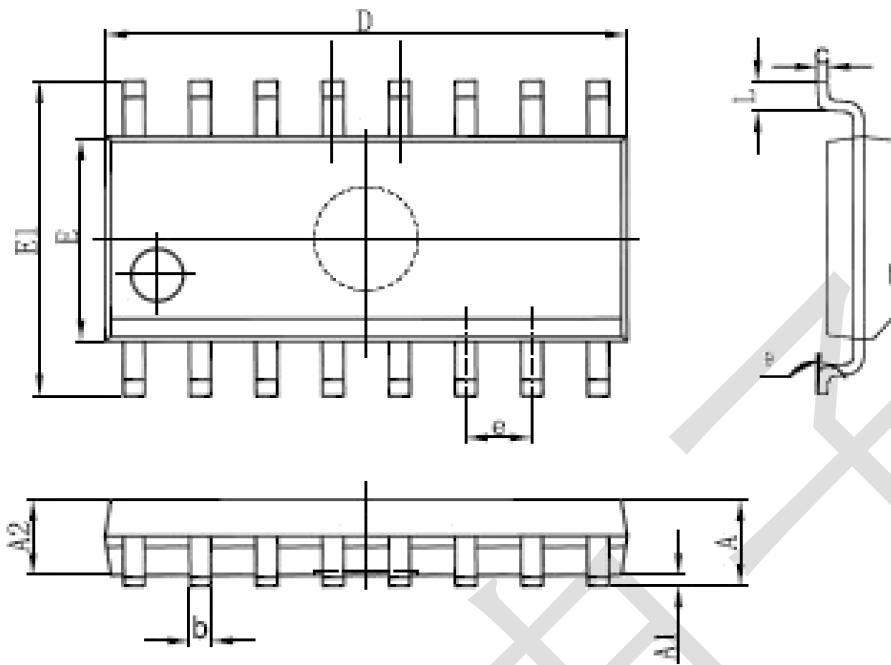




## Function Description

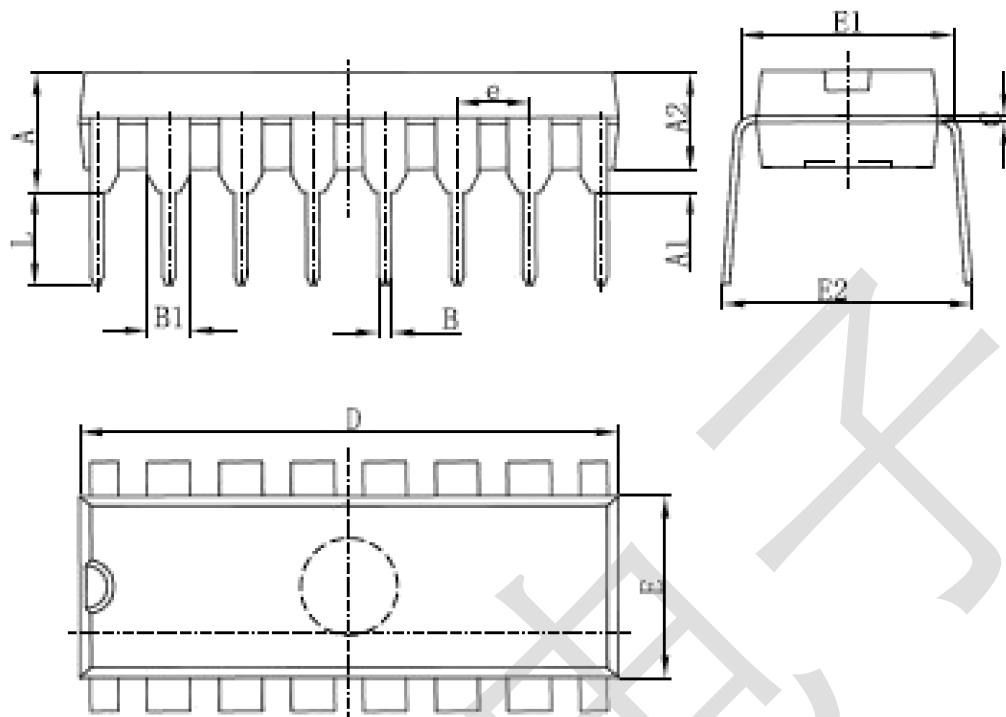
Input pin					Output pin
SI	SCK	SCLR	RCK	OE	
X	X	X	X	H	QA-QH output high impedance
X	X	X	X	L	QA-QH output RMS
X	X	L	X	X	The shift register is cleared
L	Rising edge	H	X	X	L is stored into the shift register
H	Rising edge	H	X	X	H is stored into the shift register
X	Falling edge	H	X	X	Hold the shift register state
X	X	X	Rising edge	X	Output the status value latched in the shift register
X	X	X	Falling edge	X	Hold the output status of the shift register

## Schematic diagram of packaging (SOP16)



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min	Max	Min	Max
A	1.350	1.750	0.053	0.069
A <sub>1</sub>	0.100	0.250	0.004	0.010
A <sub>2</sub>	1.350	1.550	0.053	0.061
b	0.330	0.510	0.013	0.020
c	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
E <sub>1</sub>	5.800	6.200	0.228	0.244
e	1.270 (BSC)		0.050 (BSC)	
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

## Schematic diagram of packaging (DIP16)



Symbol	Dimensions in Millimeters		Dimensions in Inches	
	Min	Max	Min	Max
A	3.710	4.310	0.148	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.128	0.142
B	0.380	0.570	0.015	0.022
B1	1.524 (BSC)		0.060 (BSC)	
C	0.204	0.380	0.008	0.014
D	18.800	19.200	0.740	0.756
E	6.200	6.600	0.244	0.260
E1	7.320	7.920	0.288	0.312
F	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	9.000	0.331	0.354

All specs and applications shown above are subject to change without prior notice.