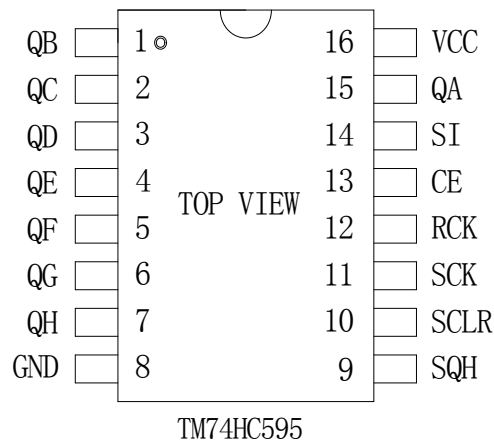


TM74HC595 is an open-drain output CMOS shift register which is designed with controllable tri-state output terminals and, when in serial output configuration, can control cascade chip of next stage. This product is excellent in performance and reliable in quality.

- 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 $T_A = 25^\circ\text{C}$

The diagram illustrates the internal structure of the 74164 shift register. It consists of eight D-type flip-flops, each with Set (SR) and Latch (LR) inputs. The serial data input (pin 14) is connected to the D input of the first flip-flop (SR_A). The Q output of each flip-flop is connected to the D input of the next flip-flop in the chain. The parallel data outputs (pins 15, 1, 2, 3, 4, 5, 6, 7) are the Q outputs of the flip-flops. The serial data output (pin 9) is the Q output of the last flip-flop (SR_H). The shift clock (pin 11) is connected to the clock inputs of all flip-flops. The reset (pin 10) and output enable (pin 13) inputs are connected to the set and latch inputs of all flip-flops, respectively. The latch clock (pin 12) is connected to the latch inputs of all flip-flops.

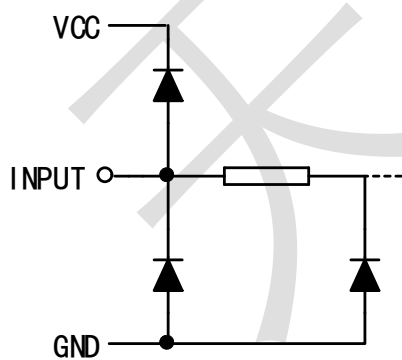
Pin arrangement



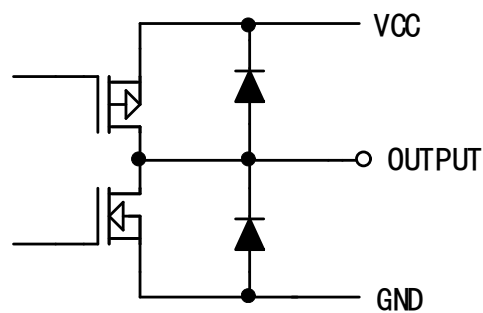
Pin Function

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.

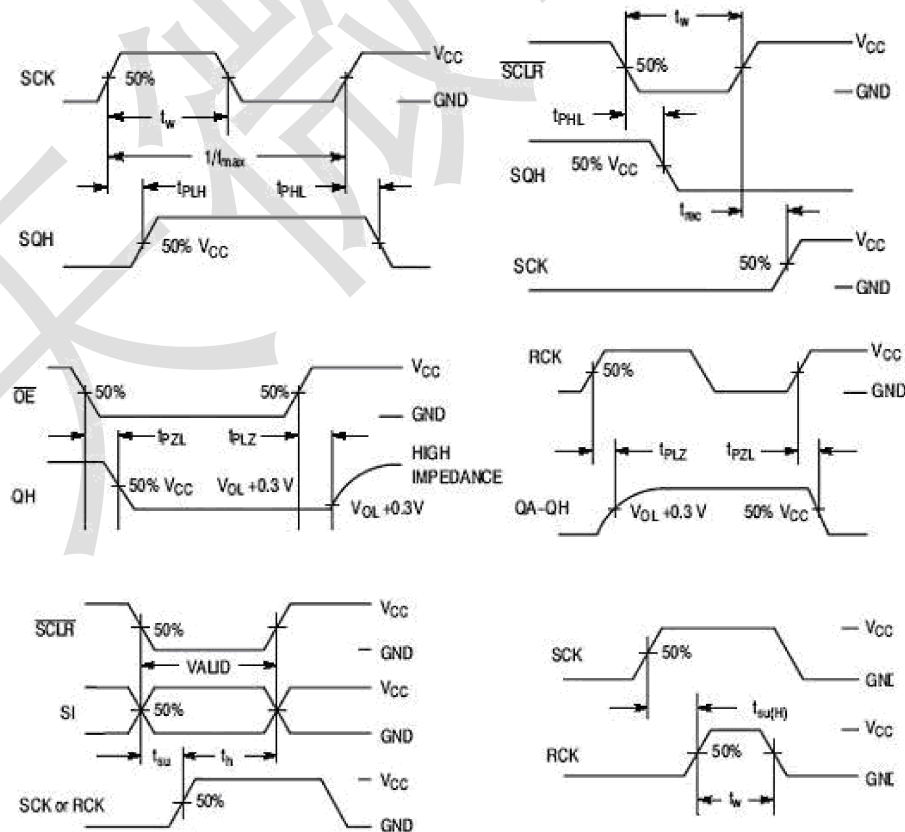
Recommended Operating Conditions

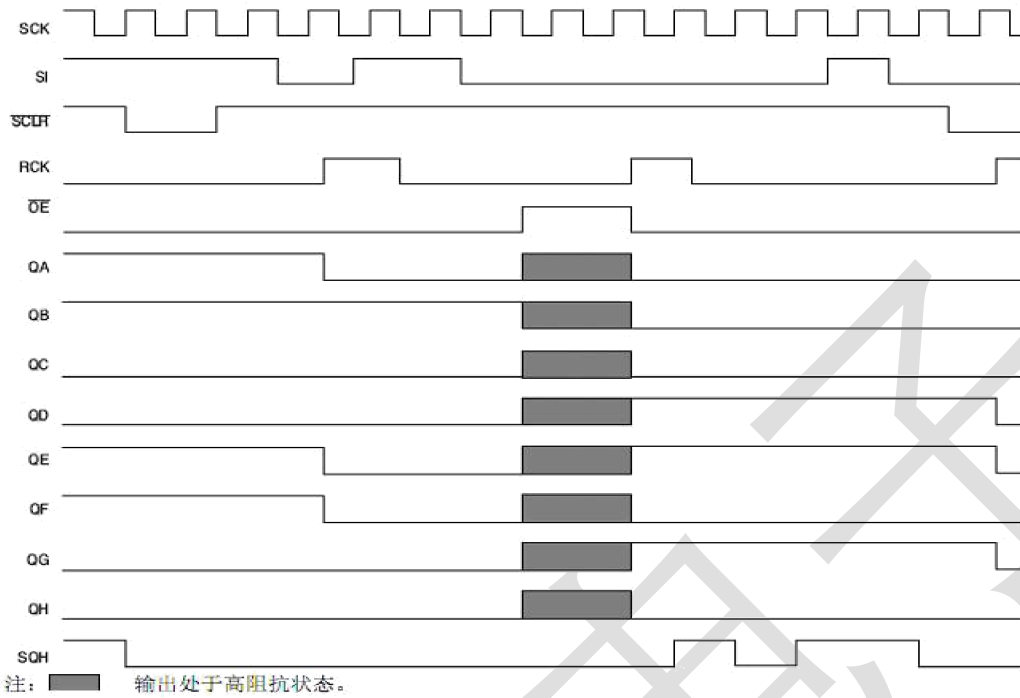
Tested at -45 °C ~ + 85 °C , unless otherwise stated		TM74HC595			Unit
Parameter Name	Parameter Symbol	Test Conditions	Minimum	Maximum	
DC VDD	V _{CC}		2.0	5.5	V
DC input voltage	V _{IN}		0	5.5	V
DC output voltage	V _{OUT}		0	V _{CC}	V
Operating temperature	T _A	V _{CC} =5V	-55	125	°C

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			
				Min	Typ	Max	Min	Max	Min	Max		
Input high level	V _{IH}	2.0		1.46			1.46		1.46		V	
		4.5		3.23			3.23		3.23			
		6.0		4.30			4.30		4.30			
Input low level	V _{IL}	2.0				0.52		0.52		0.52	V	
		4.5				1.32		1.32		1.32		
		6.0				1.77		1.77		1.77		
Output high level (SQH)	V _{OH}	2.0	V _I =V _{I_H} or V _{IL}	I _O =-20μA	1.9	2.0		1.9		1.9	V	
		4.5			4.4	4.5		4.4		4.4		
		6.0			5.9	6.0		5.9		5.9		
		4.5			4.18	4.31		4.13		4.10		
		6.0			5.68	5.8		5.63		5.60		
Output high level (QA- QH)	V _{OH}	2.0	V _I =V _{I_H} or V _{IL}	I _O =-20μA	1.9	2.0		1.9		1.9	V	
		4.5			4.4	4.5		4.4		4.4		
		6.0			5.9	6.0		5.9		5.9		
		4.5			4.18	4.31		4.13		4.10		
		6.0			5.68	5.8		5.63		5.60		
Output low level (SQH)	V _{OL}	2.0	V _I =V _{I_H} or V _{IL}	I _O =20μA		0.0	0.1		0.1		V	
		4.5				0.0	0.1		0.1			
		6.0				0.0	0.1		0.1			
		4.5			I _O =4.0mA	0.17	0.26		0.33			0.40
		6.0			I _O =5.2mA	0.18	0.26		0.33			0.40
Output low level (QA- QH)	V _{OL}	2.0	V _I =V _{I_H} or V _{IL}	I _O =20μA		0.0	0.1		0.1		V	
		4.5				0.0	0.1		0.1			
		6.0				0.0	0.1		0.1			
		4.5			I _O =6.0mA	0.17	0.26		0.33			0.40
		6.0			I _O =7.8mA	0.18	0.26		0.33			0.40
Quiescent Current	I _{CC}	6.0	V _I =V _{CC} or GND				4		40		80	μA

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	T _A =25°C	T _A =-40 ~ 85°C	T _A =-55 ~ 125°C	
			Range	Range	Range	
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

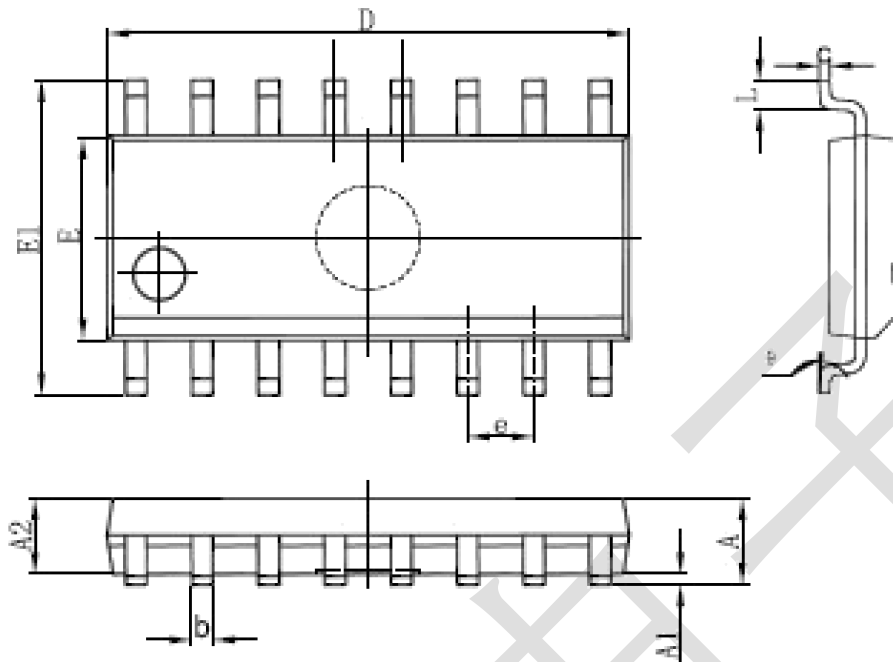




Function Description

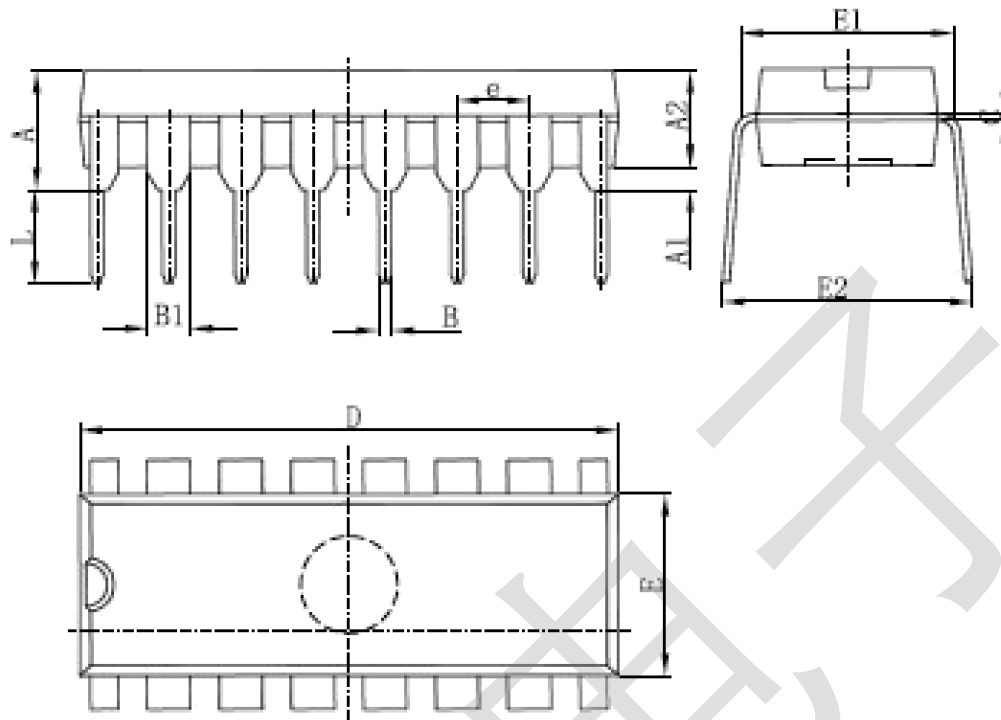
Input pin					Output pin
SI	SCK	SCLR	RCK	OE	
X	X	X	X	H	QA-QH output high impedance
X	X	X	X	L	QA-QH output RMS
X	X	L	X	X	The shift register is cleared
L	Rising edge	H	X	X	L is stored into the shift register
H	Rising edge	H	X	X	H is stored into the shift register
X	Falling edge	H	X	X	Hold the shift register 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
A1	0.100	0.250	0.004	0.010
A2	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
E1	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	0.146	0.170
A1	0.510		0.020	
A2	3.200	3.600	0.126	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
e	2.540 (BSC)		0.100 (BSC)	
L	3.000	3.600	0.118	0.142
E2	8.400	8.000	0.331	0.354

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