

■ Product Introduction

74HC595 is an 8-bit CMOS shift register. The 8-bit parallel output port is a controllable three state output, and a serial output port can achieve multi-level chip serial control, forming an 8n bit (n is the number of chips) parallel output.

■ Product Features

- low input current: $\leq 1\mu A$
- low power consumption: $I_{cc} \leq 5.0 \mu A$, @ $V_{CC}=6V$
- Controllable Tristate Output Design
- Standard Serial (SPI) Package
- CMOS serial output, can be used for cascading multiple devices
- Package Type : DIP16 、 SOP16 and TSSOP16

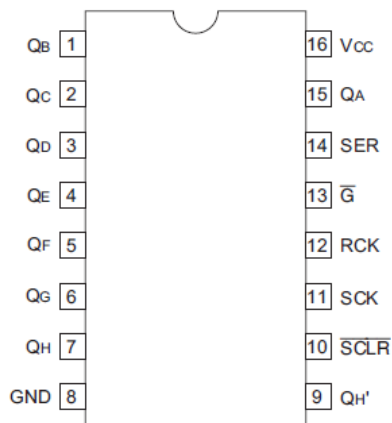
■ Product Application

- LED Segment Displays drive
- other application field
- Automation Engineering Control

■ Product Information

product name	Package	Silk Printing Name	Package	quantity
74HC595N	DIP16	74HC595	Tube	1000 pcs/box
74HC595M/TR	SOP16	74HC595	Reel	2500 pcs/reel
74HC595MT/TR	TSSOP16	HC595	Reel	2500pcs/reel

DIP16/SOP16



■ Packaging form and pin function definition

DIP16/SOP16		
Pin Number	Pin Definition	Function Description
15	Q _A	Q _A ~Q _H Eight bit data parallel output terminal
1~7	Q _B ~Q _G	
8	GND	Power Supply Ground
9	Q' _H	Serial data output pins
10	SCLR	Shift Register Clear Terminal
11	SCK	Data Input Clock Terminal
12	RCK	Output Memory Latching Clock End
13	G	Output Enabling Terminal
14	SER	Data Input Terminal
16	VCC	Power Supply Terminal

■ Truth Table (“↑” Indicates the rising edge; “↓” Indicates the falling edge)

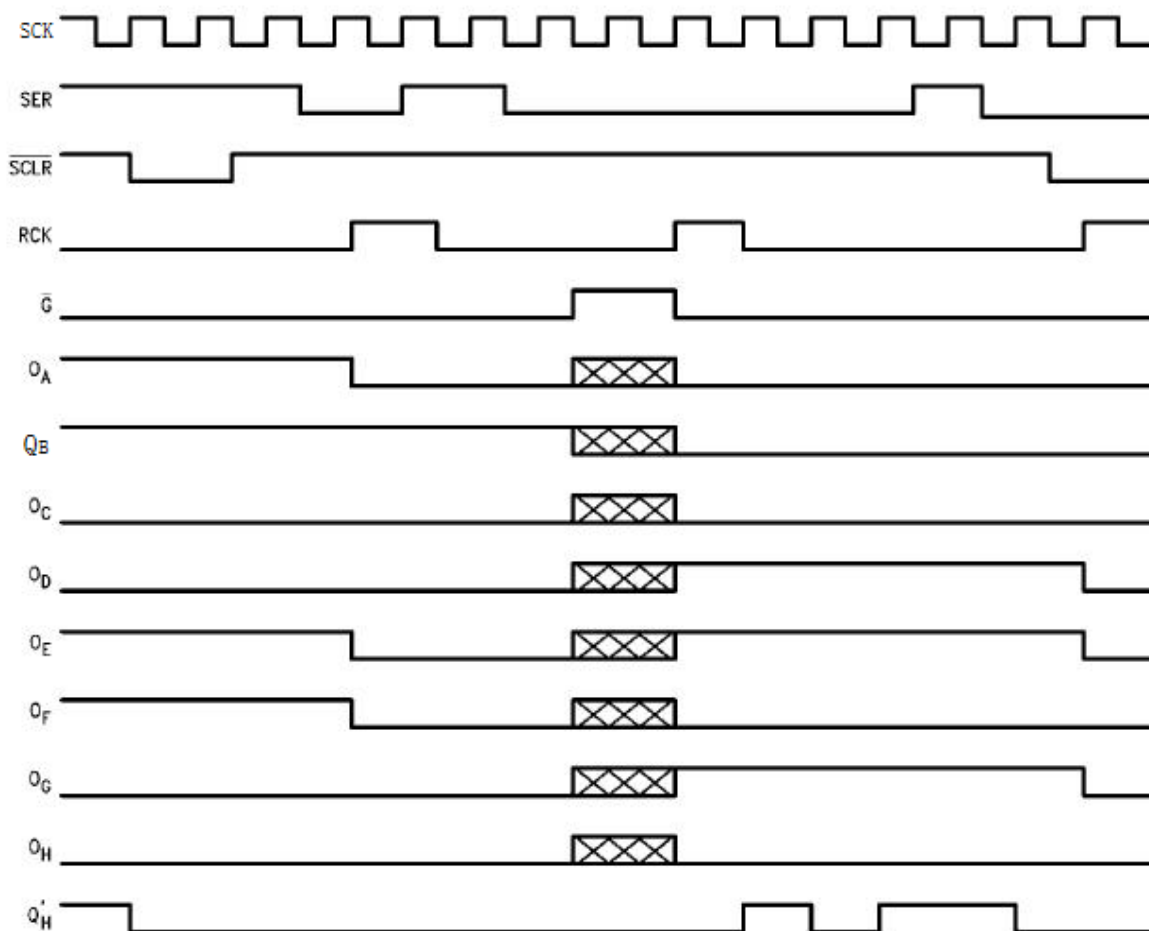
Input Pin					Output Pin
SER	RCK	SCK	SCLR	G	
X	X	X	X	H	Q _A ~Q _H Output high resistance state
X	X	X	X	L	Q _A ~Q _H Output terminal output effective value L or H
X	X	X	L	L	Shift Register Clearing, Q' _H =0
L	X	↑	H	L	Shift register storage L value, Q' _H Output Q _n -1
H	X	↑	H	L	Shift register storage H Value, Q' _H Output Q _n -1
X	X	↓	H	L	Shift register status remains the same
X	↑	X	H	L	state value Parallel output in an 8-bit latch shift register
X	↓	X	H	L	Memory output status remains the same

■ Limit parameter

Parameter	Symbol	Limit Value	Unit
Operating Volatge	V_{CC}	- 0.5 to 6.5	V
Input/Output Voltage	V_{IN} 、 V_{OUT}	- 0.5 to $V_{CC}+0.5$	V
Input/output clamping current	I_{IK} 、 I_{OK}	±20	mA
Output Current	I_{OUT}	±35	mA
VCC、GND Current	I_{CC} 、 I_{GND}	±70	mA
Power Dissipation	P_D	500	mW
Operating Temperature	T_A	-40~85	°C
Storage Temperature	T_S	-65~150	°C
Pin welding temperature	T_W	260, 10s	°C

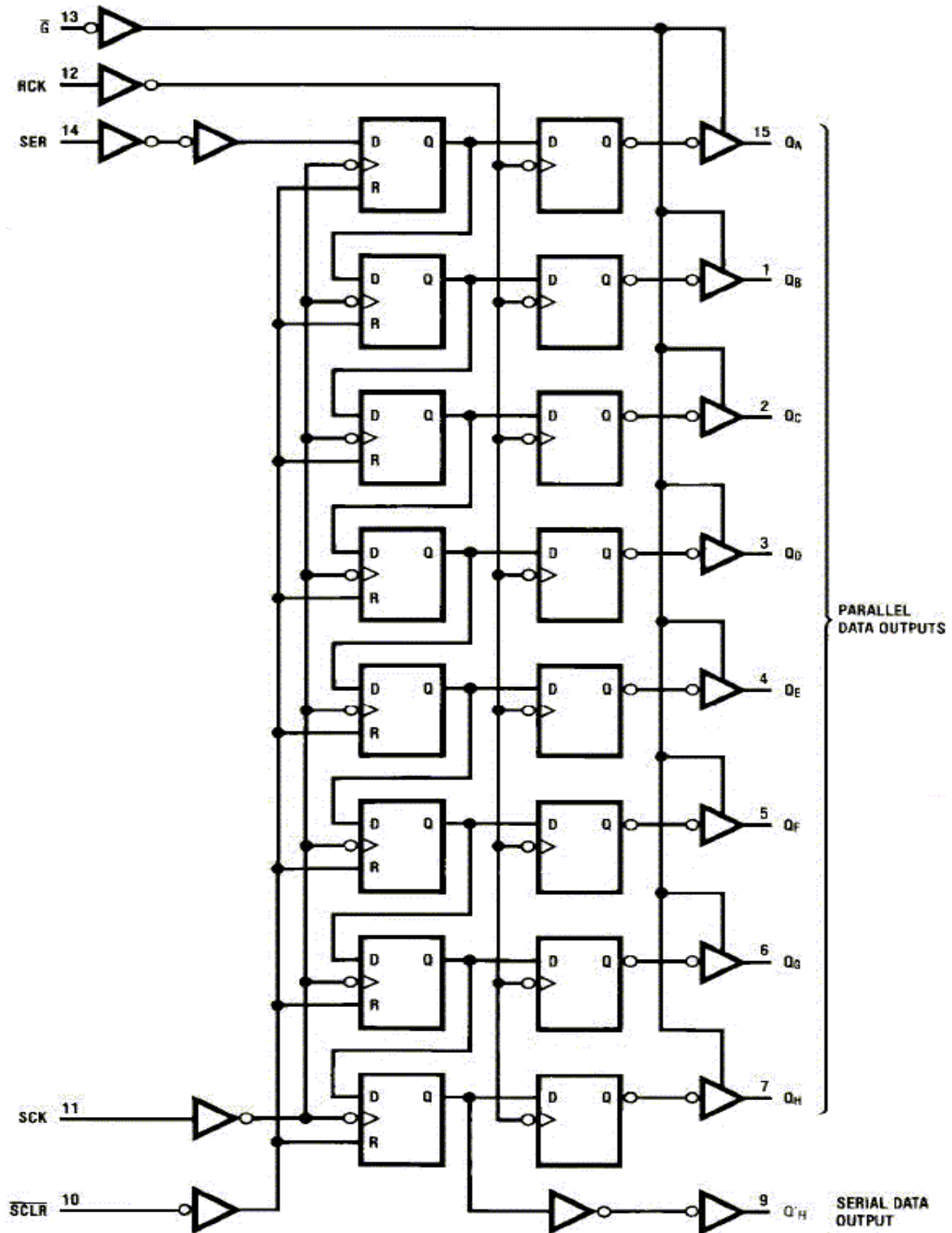
Note: Limit parameters refer to the limit values that cannot be exceeded under any conditions. If this limit value is exceeded, it may cause physical damage such as product deterioration; At the same time, it cannot be guaranteed that the chip can operate normally when approaching the limit parameters.

■ Timing Diagram



NOTE:  Implies that the output is in TRI-STATE mode.

■ SCHEMATIC DIAGRAM



■ Operation Conditions

Item	Symbol	MIN	TYP	MAX	UNIT
Power Supply Voltage	V_{CC}	2	5	6	V
Input Output Voltage	V_{IN} 、 V_{out}	0		V_{CC}	V
Input Rise/ Falling Time	t_r t_f	$V_{CC}=2.0V$		1000	ns
		$V_{CC}=4.5V$		500	ns
		$V_{CC}=6.0V$		400	ns

■ Electrical Characteristics

DC electrical characteristics : $T_A=25^{\circ}C$

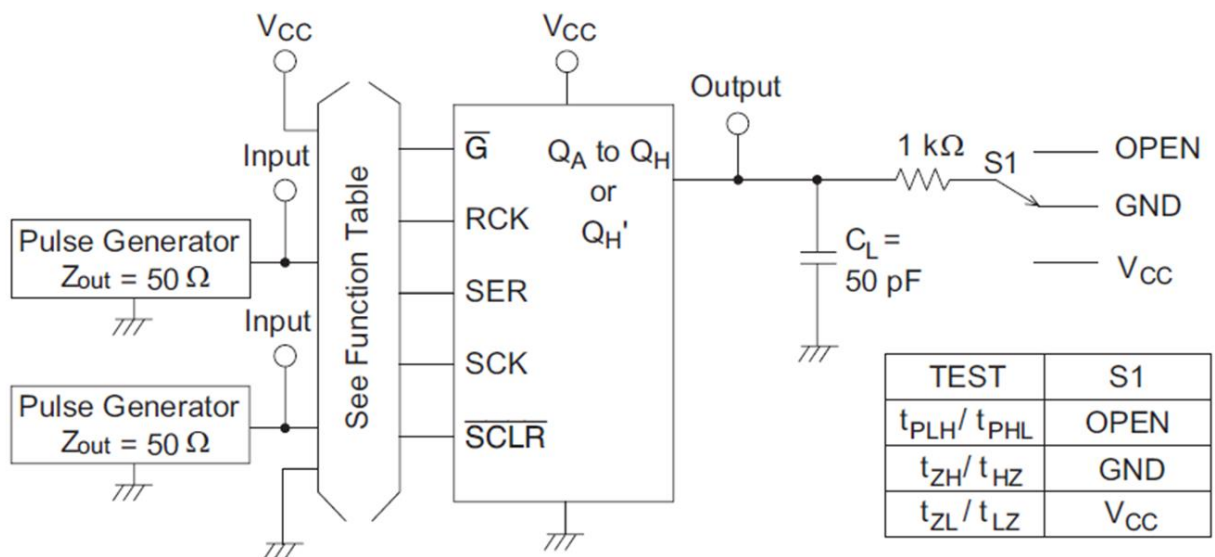
Symbol	ITEM		Measuring Condition		VCC(V)	MIN	TYP	MAX	UNIT	
V _{IH}	High Level Effective Output Voltage				2.0	1.5			V	
					4.5	3.15			V	
					6.0	4.2			V	
V _{IL}	Low Level Effective Output Voltage				2.0			0.5	V	
					4.5			1.35	V	
					6.0			1.8	V	
V _{OH}	High Level Output Voltage	Q _A to Q _H Q' _H	V _I = V _{IH} or V _{IL}	I _{OH} =20μA	2.0	1.9			V	
					4.5	4.4			V	
					6.0	5.9			V	
		Q _A to Q _H		I _{OH} =6.0mA	4.5	3.9	4.3		V	
				I _{OH} =7.8mA	6.0	5.2	5.8		V	
				I _{OH} =4.0mA	4.5	3.9	4.2		V	
		Q' _H		I _{OH} =5.2mA	6.0	5.2	5.7		V	
V _{OL}	Low Level Output Voltage	Q _A to Q _H Q' _H	V _I = V _{IH} or V _{IL}	I _{OH} =20μA	2.0			0.1	V	
					4.5			0.1	V	
					6.0			0.1	V	
		Q _A to Q _H		I _{OH} =6.0mA	4.5		0.2	0.4	V	
				I _{OH} =7.8mA	6.0		0.25	0.4	V	
				I _{OH} =4.0mA	4.5		0.2	0.5	V	
		Q' _H		I _{OH} =5.2mA	6.0		0.15	0.5	V	
I _{OZ}	output current at close state		V _{OUT} =V _{CC} or GND, V _I =V _{IH} or V _{IL}		6.0			10	uA	
I _{IN}	Input Current		V _I =V _{CC} or GND		6.0			1	uA	
I _{CC}	Operating Current		V _I =V _{CC} or GND,I _{OUT} =0μA		6.0			5	uA	
V _{CC}	Operating Voltage					2		6	V	

AC electrical characteristics: $T_a=25^{\circ}\text{C}$ $V_{CC}=5.0\text{V}$, $t_r=t_f \leq 20\text{ns}$, see measuring method below.

Symbol	ITEM	Measuring Condition	MIN	TYP	MAX	UNIT
f_{Max}	SCK Maximum operating frequency			10		MHZ
t_{PHL} , t_{PLH}	Transmission delay time SCK to Q'_H	$C_L=50\text{pF}$		100		ns
	Transmission delay time RCK to Q_A thru Q_H	$C_L=50\text{pF}$		100		ns
	Transmission delay time $\overline{\text{SCLR}}$ to Q'_H	$C_L=50\text{pF}$		50		ns
t_{ZH} , t_{ZL}	Output Enable Time $\overline{G}$ to Q_A thru Q_H	$R_L=1\text{k}\Omega$ $C_L=50\text{pF}$		17		ns
t_{HZ} , t_{LZ}	Output Disable Time $\overline{G}$ to Q_A thru Q_H	$R_L=1\text{k}\Omega$ $C_L=50\text{pF}$		15		ns
t_{SU}	Min Storage Time SER to SCK			20		ns
t_{SU}	Min Storage Time SCK to RCK			20		ns
T_{rem}	Min Clear Time SCLR to SCK			10		ns
t_{W}	Min Pulse Width SCK or $\overline{\text{SCLR}}$			20		ns
t_{H}	Min Holding Time SER to SCK			5		ns
t_{TLH} , t_{THL}	Output Rise/Falling Edge Time Q_A thru Q_H , Q'_H			100		ns

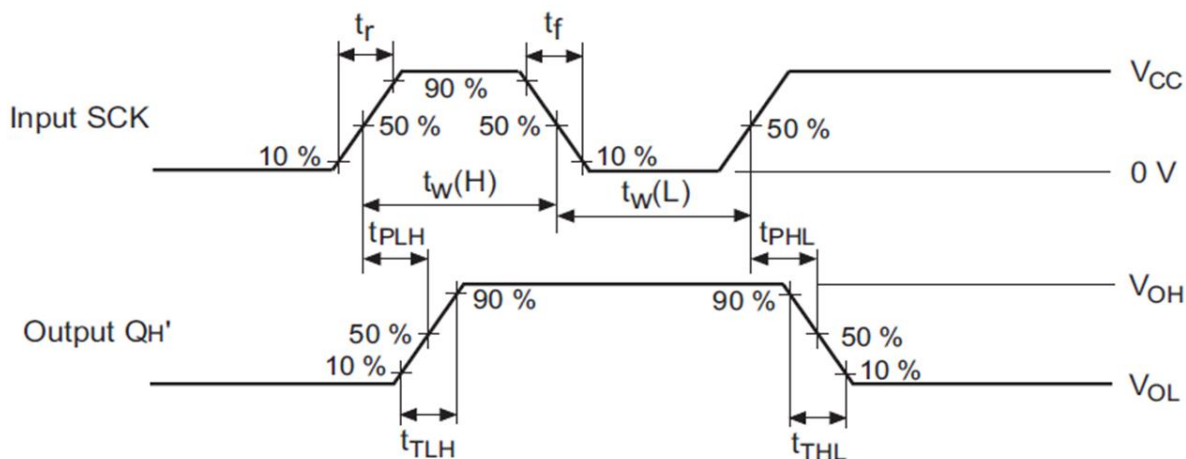
■ Measurement Method

1. Wiring Diagram



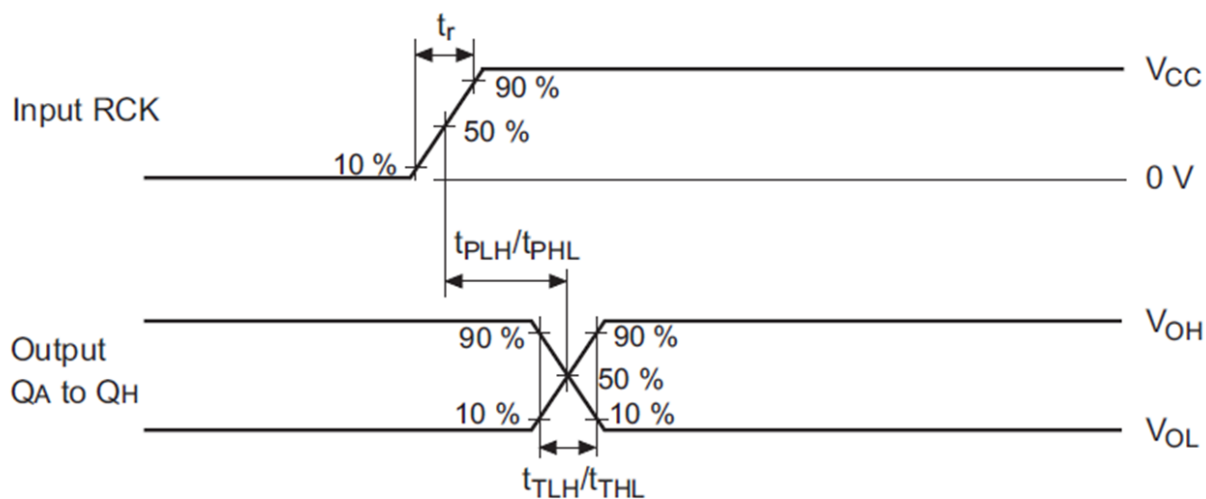
2. Waveform measurement schematic diagram

• Waveform – 1 (SCK to QH')



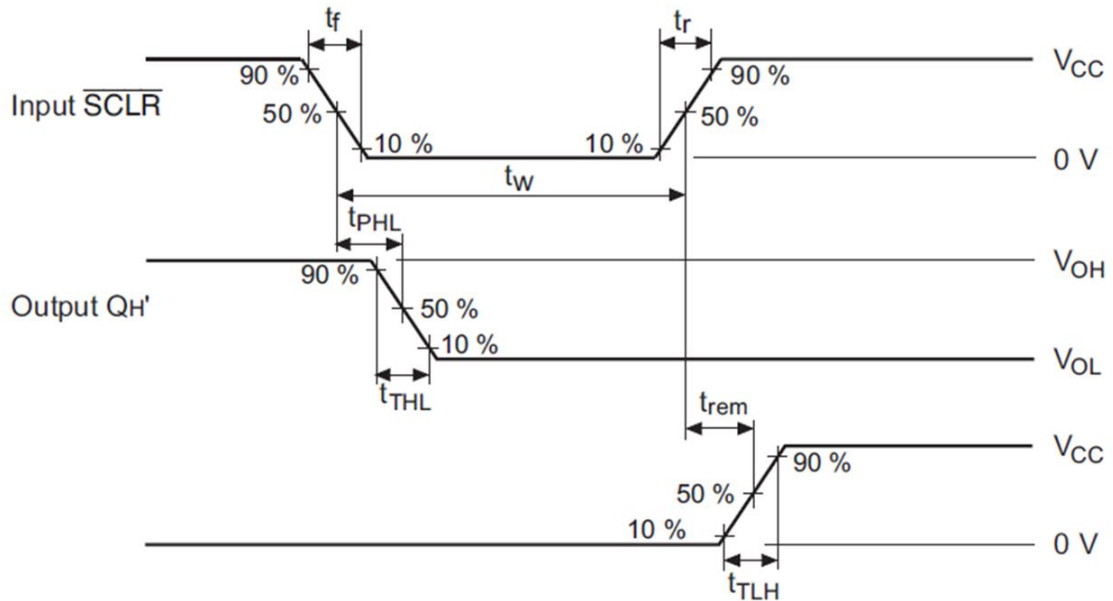
Note : 1. Input waveform : $PRR \leq 1 \text{ MHz}$, duty cycle 50%.

• Waveform – 2 (RCK to Q)



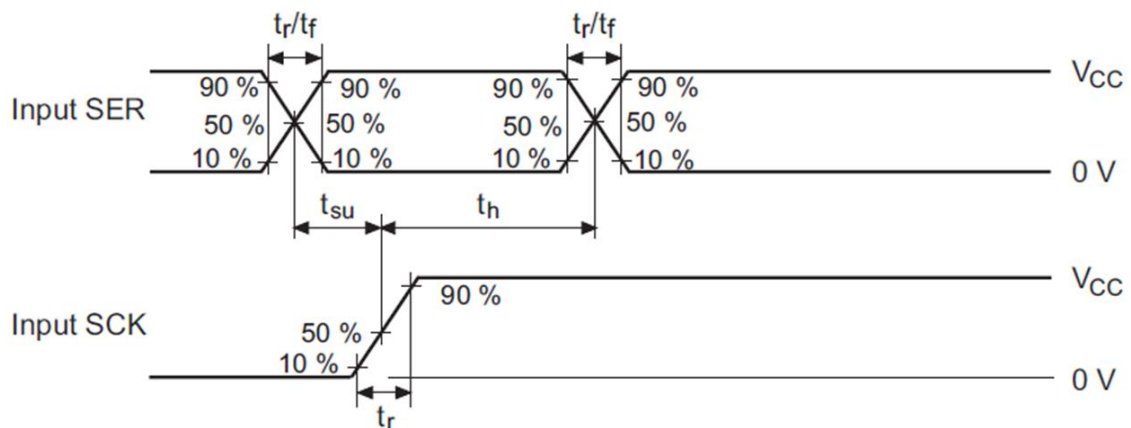
Note : 1. Input waveform : $PRR \leq 1 \text{ MHz}$, duty cycle 50%

• Waveform – 3 ($\overline{\text{SCLR}}$ to QH')



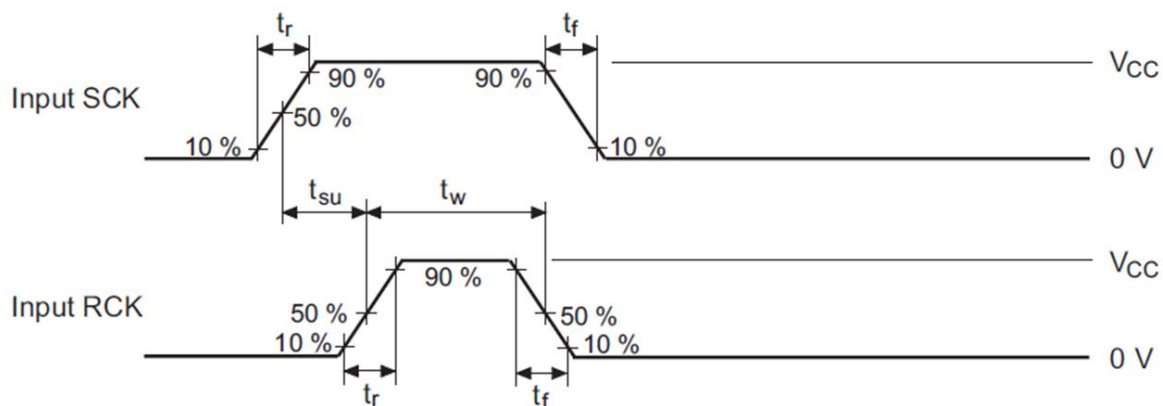
Note : 1. Input waveform : PRR $\leq$ 1 MHz, duty cycle 50%

• Waveform – 4 (SER to SCK)



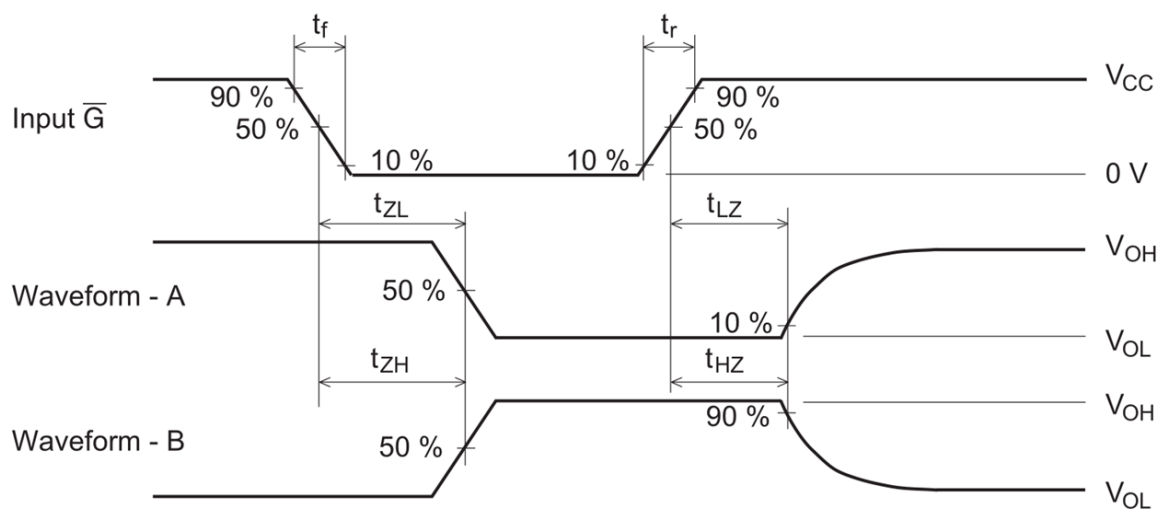
Note : 1. Input waveform : PRR $\leq$ 1 MHz, duty cycle 50%

• Waveform – 5 (SCK to RCK)



Note : 1. Input waveform : PRR $\leq$ 1 MHz, duty cycle 50%

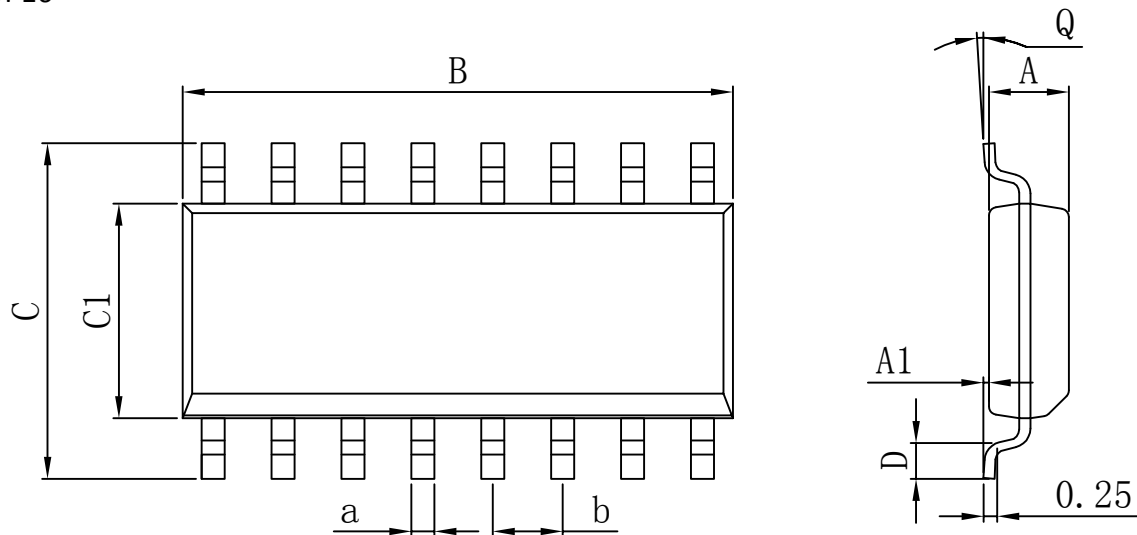
• Waveform – 6 (t_{ZL} , t_{ZH} , t_{LZ} , t_{HZ})



- Notes :
1. Input waveform : PRR $\leq$ 1 MHz, duty cycle 50%
 2. Waveform - A is for an output with internal conditions such that the output is low except when disabled by the output control.
 3. Waveform - B is for an output with internal conditions such that the output is high except when disabled by the output control.
 4. The output are measured one at a time with one transition per measurement.

Package Outline

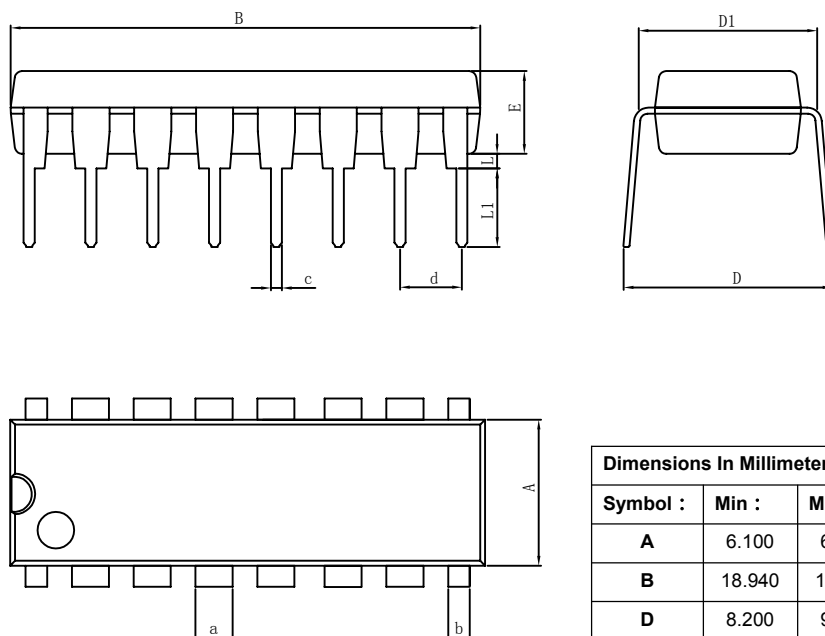
SOP16



Dimensions In Millimeters

Symbol :	Min :	Max :	Symbol :	Min :	Max :
A	1.225	1.570	D	0.400	0.950
A1	0.100	0.250	Q	0°	8°
B	9.800	10.00	a	0.420 TYP	
C	5.800	6.250	b	1.270 TYP	
C1	3.800	4.000			

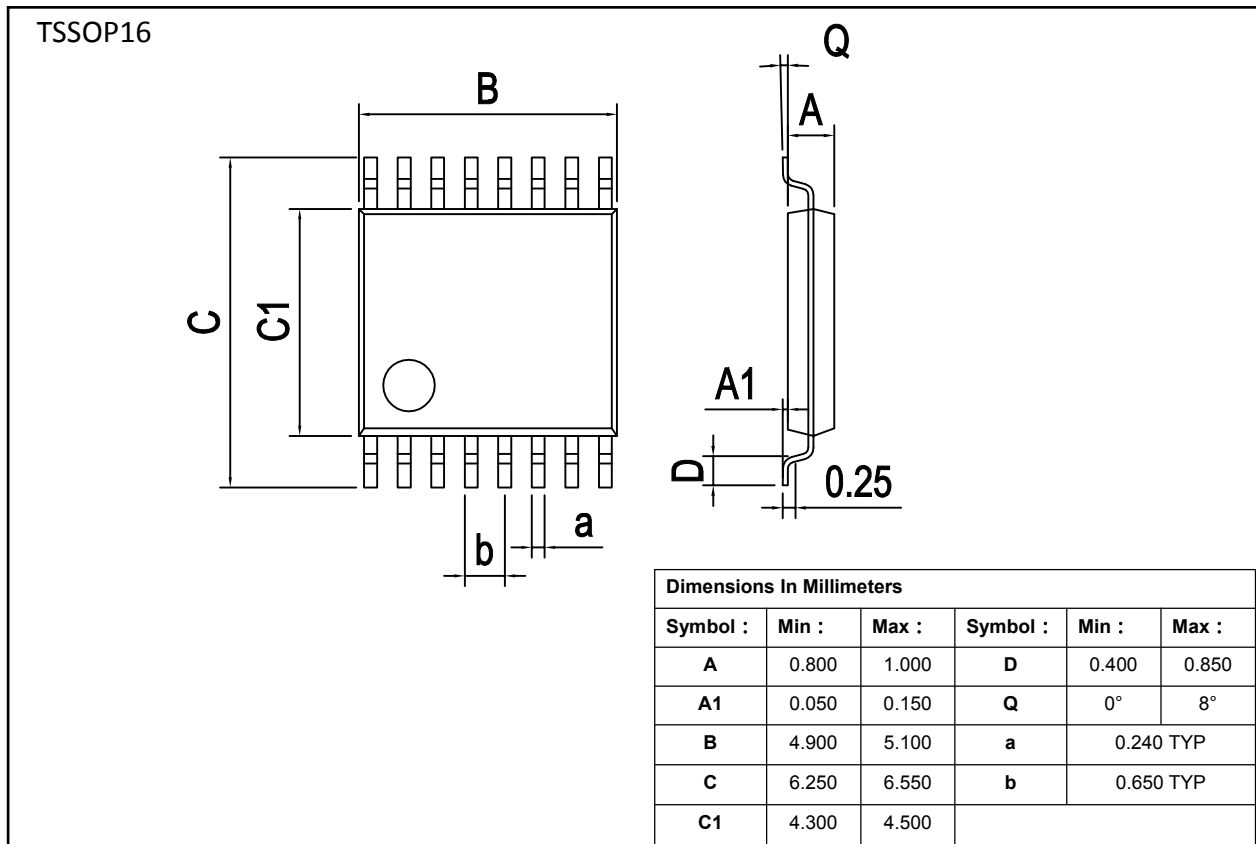
DIP16



Dimensions In Millimeters

Symbol :	Min :	Max :	Symbol :	Min :	Max :
A	6.100	6.680	L	0.500	0.800
B	18.940	19.560	a	1.524 TYP	
D	8.200	9.200	b	0.889 TYP	
D1	7.42	7.820	c	0.457 TYP	
E	3.100	3.550	d	2.540 TYP	
L	0.500	0.800			

Package Outline



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