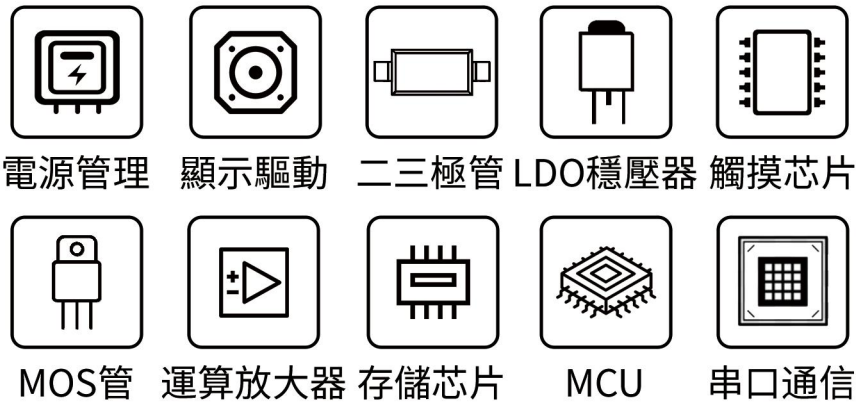
TDSEMIC
拓電半導體

自主封測 品質把控 售後保障

WEB | WWW.TDSEMIC.COM

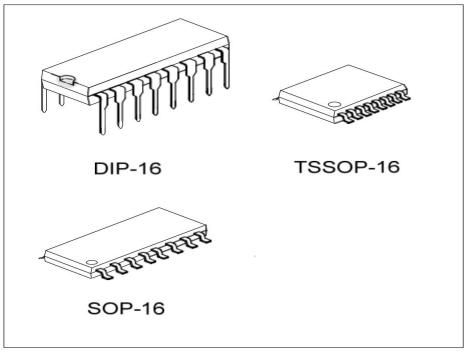


74HC595D-TD

產品規格說明書

1. DESCRIPTION

The 74HC595 contains an 8-bit register with asynchronous reset input and an 8-bit latch with output. The Serial Data Input (SER) will shift into the internal shift register during every LOW-to-HIGH transition on the Shift Clock. The latch will latch the 8-bit data from the shift register during the LOW-to-HIGH transition on the Latch Clock. The shift register also provides a serial output.



2. FEATURES

- Operation Voltage Range: 2 ~ 6V
- High Noise Immunity
- Output Compatibility with CMOS and TTL
- Specified from -40 ~ +125°C
- Package option：DIP-16,SOP-16 and TSSOP-16
- Latch-up performance ≤ 250 mA
- ESD protection:
  - HBM：ANSI/ESDA/JEDEC JS-001 2023 exceeds 2000 V
  - CDM：ANSI/ESDA/JEDEC JS-002 2022 exceeds 2000 V

3. ORDERING INFORMATION

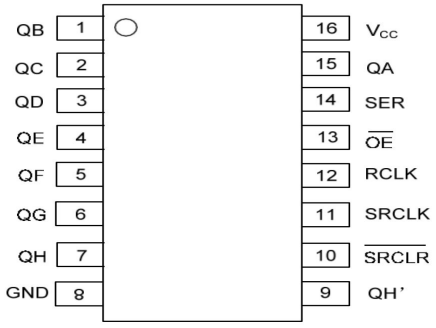
- **Tube**

Part Number	Marking code	Package	Packing	Pcs/Tube	Pcs/Box
74HC595	74HC595	DIP-16	Tube	25	1250

- **Tape Reel**

Part Number	Marking code	Package	Packing	Pcs/Reel	Pcs/ Box
74HC595	74HC595	SOP-16	Tape Reel	2.5k	50K
74HC595	74HC595	TSSOP-16	Tape Reel	5K	80K

4. PIN CONFIGURATION

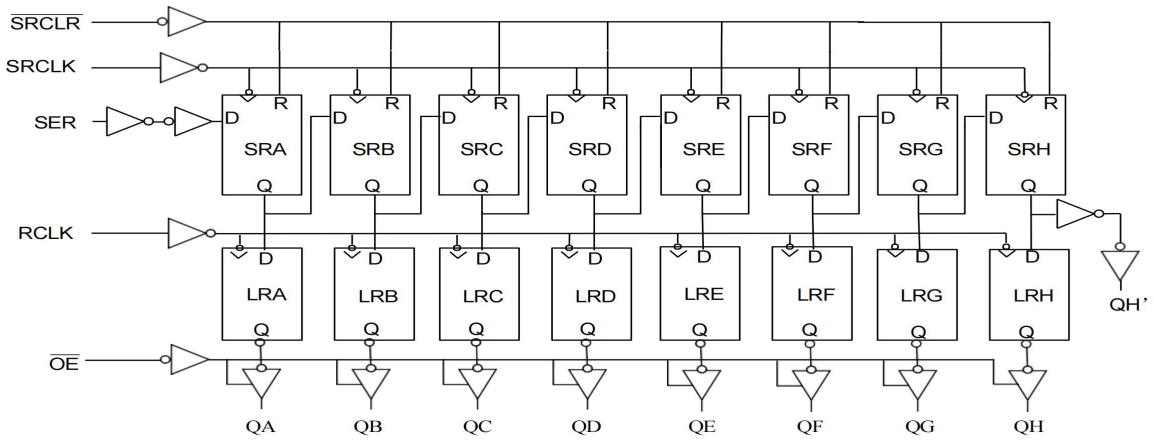


5. FUNCTION TABLE

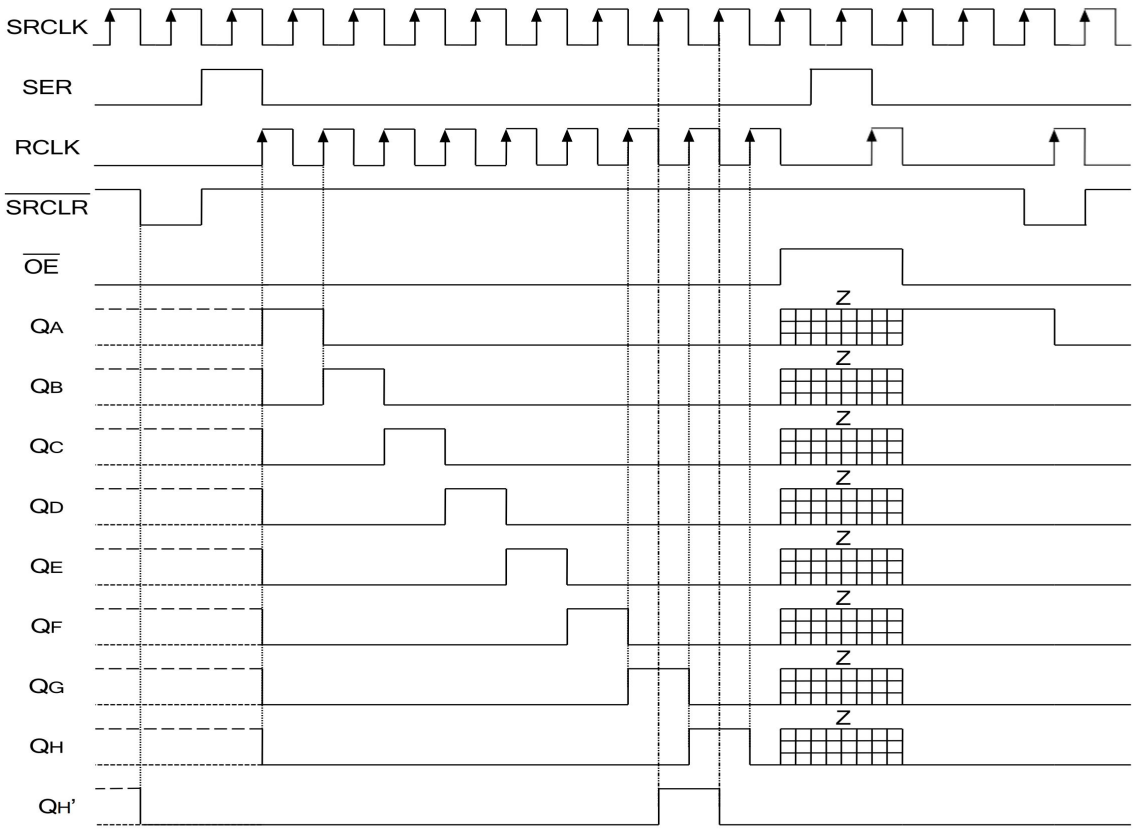
FUNCTION	INPUTS					OUTPUTS	
	SRCLK	RCLK	$\overline{OE}$	$\overline{SRCLR}$	SER	QH'	Qn
A Low-Level on $\overline{SRCLR}$ only affects the shift registers.	X	X	L	L	X	L	NC
Empty shift register loaded into storage register.	X	↑	L	L	X	L	L
Shift register clear. Parallel outputs in high-impedance OFF-state	X	X	H	L	X	L	Z
Logic high level shifted into the first shift register. Contents of all shift register stages shifted through, e.g. previous state of stage G(internal QG') appears on the serial output(QH').	↑	X	L	H	H	QG'	NC
Contents of shift register stages (internal Qn') are transferred to the storage register and parallel output stages.	X	↑	L	H	X	NC	Qn'
Contents of shift register shifted through. Previous contents of the shift register is transferred to the storage register and the parallel output stages.	↑	↑		H	X	QG'	Qn'

Note: H : HIGH voltage level.
L : LOW voltage level.
X : Don't care.
Z : High impedance OFF-state.
NC: No change.
↑ : Low-to-High transition.
↓ : High-to-Low transition.

6. LOGIC DIAGRAM



7. TIMING DIAGRAM



8. ABSOLUTE MAXIMUM RATING (Note 1)

PARAMETER		SYMBOL	RATINGS	UNIT
Supply Voltage		V_{CC}	-0.5~7.0	V
Input Clamp Current (V_{IN} <0 or V_{IN} >V_{CC})		I_{IK} (Note 2)	±20	mA
Output Clamp Current (V_{OUT} <0 or V_{OUT} >V_{CC})		I_{OK} (Note 2)	±20	mA
Output Current		I_{OUT}	±35	mA
V_{CC} or GND Current		I_{CC}	±75	mA
Power Dissipation	DIP-16	P_D	750	mW
	SOP-16		500	mW
	SOP-16N		550	mW
	SSOP-16 SSOP-16N TSSOP-16		450	mW
Storage Temperature		T_{STG}	-65 ~ +150	°C

Notes: 1. Absolute maximum ratings are those values beyond which the device could be permanently damaged. Absolute maximum ratings are stress ratings only and functional device operation is not implied.
2. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

9. RECOMMENDED OPERATING COMDITIONS

PARAMETER		SYMBOL	MIN	TYP	MAX	UNIT
Supply Voltage		V_{CC}	2	-	6	V
Input Voltage		V_{IN}	0	-	V_{CC}	V
Output Voltage		V_{OUT}	0	-	V_{CC}	V
Operating Temperature		T_A	-40	-	+125	°C
Input Transition Rise or Fall Time	V_{CC}=2V	t_R / t_F	-	-	100	ns
	V_{CC}=4.5V		-	-	20	ns
	V_{CC}=6V		-	-	20	ns

10. ELECTRICAL CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40°C~+125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
High-Level Input Voltage	V_{IH}	V_{CC} =2V	1.5	-	-	1.5	-	-	V
		V_{CC} =3V	2.1	-	-	2.1	-	-	V
		V_{CC} =4.5V	3.15	-	-	3.15	-	-	V
		V_{CC} =6V	4.2	-	-	4.2	-	-	V
Low-Level Input Voltage	V_{IL}	V_{CC} =2V	-	-	0.5	-		0.5	V
		V_{CC} =3V	-	-	0.9	-	-	0.9	V
		V_{CC} =4.5V	-	-	1.35	-	-	1.35	V
		V_{CC} =6V	-	-	1.8	-	-	1.8	V
High-Level Output Voltage, QA-QH	V_{OH}	V_{CC} =2V, I_{OH} =-20μA	1.9	2.0	-	1.9	-	-	V
		V_{CC} =4.5V, I_{OH} =-20μA	4.4	4.5	-	4.4	-	-	V
		V_{CC} =6V, I_{OH} =-20μA	5.9	6.0	-	5.9	-	-	V
		V_{CC} =3V, I_{OH} =-2.4mA	2.48	-	-	2.3	-	-	V
		V_{CC} =4.5V, I_{OH} =-6mA	3.98	-	-	3.7	-	-	V
		V_{CC} =6V, I_{OH} =-7.8mA	5.48	-	-	5.2	-	-	V
Low-Level Output Voltage, QA-QH	V_{OL}	V_{CC} =2V, I_{OL} =20μA	-	0.002	0.1	-	-	0.1	V
		V_{CC} =4.5V, I_{OL} =20μA	-	0.001	0.1	-	-	0.1	V
		V_{CC} =6V, I_{OL} =20μA	-	0.001	0.1	-	-	0.1	V
		V_{CC} =3V, I_{OL} =2.4mA	-	-	0.26	-	-	0.4	V
		V_{CC} =4.5V, I_{OL} =6mA	-	-	0.26		-	0.4	V
		V_{CC} =6V, I_{OL} =7.8mA	-	-	0.26	-	-	0.4	V
High-Level Output Voltage, QH'	V_{OH}	V_{CC} =2V, I_{OH} =-20μA	1.9	2.0	-	1.9	-	-	V
		V_{CC} =4.5V, I_{OH} =-20μA	4.4	4.5	-	4.4	-	-	V
		V_{CC} =6V, I_{OH} =-20μA	5.9	6.0	-	5.9	-	-	V
		V_{CC} =3V, I_{OH} =-2.4mA	2.48	-	-	2.3	-	-	V
		V_{CC} =4.5V, I_{OH} =-4mA	3.98	-	-	3.7	-	-	V
		V_{CC} =6V, I_{OH} =-5.2mA	5.48	-	-	5.2	-	-	V
Low-Level Output Voltage, QH'	V_{OL}	V_{CC} =2V, I_{OL} =20μA	-	0.002	0.1	-	-	0.1	V
		V_{CC} =4.5V, I_{OL} =20μA	-	0.001	0.1	-	-	0.1	V
		V_{CC} =6V, I_{OL} =20μA	-	0.001	0.1	-	-	0.1	V
		V_{CC} =3V, I_{OL} =2.4mA	-	-	0.26	-	-	0.4	V
		V_{CC} =4.5V, I_{OL} =4mA		-	0.26	-	-	0.4	V
		V_{CC} =6V, I_{OL} =5.2mA		-	0.26	-	-	0.4	V
Input Leakage Current	$I_{I(LEAK)}$	V_{CC} =6V, V_{IN} = V_{CC} or GND		-	±0.1	-	-	±1	μA
Output Off-State Current	I_{OZ}	V_{CC} =6V V_{OUT} =V_{CC} or GND	-	-	±0.5	-	-	±10	μA
Quiescent Supply Current	I_{CC}	V_{CC} =6V V_{IN}= V_{CC} or GND, I_{OUT}=0	-	-	4	-	-	160	μA

11. DYNAMIC CHARACTERISTICS

PARAMETER	SYMBOL	TEST CONDITIONS		T_A=25°C			T_A=-40°C~+125°C			UNIT
				MIN	TYP	MAX	MIN	TYP	MAX	
Maximum Clock Pulse Frequency	f_{max}	C_L=50pF	V_{CC} =2V	6	26	-	4	-	-	MHz
			V_{CC} =4.5V	30	38	-	20	-	-	MHz
			V_{CC} =6V	35	42	-	24	-	-	MHz
Propagation Delay From Input (SRCLK) to Output (Q_H')	t_{PD}	C_L=50pF	V_{CC} =2V	-	210	500	-	-	600	ns
			V_{CC} =4.5V	-	70	175	-	-	300	ns
			V_{CC} =6V	-	50	150	-	-	250	ns
Propagation Delay From Input (RCLK) to Output (Q_A-Q_H)		C_L=50pF	V_{CC} =2V	-	50	140	-	-	265	ns
			V_{CC} =4.5V	-	17	28	-	-	53	ns
			V_{CC} =6V	-	14	24	-	-	45	ns
		C_L=150pF	V_{CC} =2V	-	60	200	-	-	250	ns
			V_{CC} =4.5V	-	22	40	-	-	50	ns
			V_{CC} =6V	-	19	34	-	-	43	ns
Propagation Delay From Input ($\overline{SRCLR}$) to Output (Q_H')	t_{PHL}	C_L=50pF	V_{CC} =2V	-	210	500	-	-	600	ns
			V_{CC} =4.5V	-	70	175	-	-	300	ns
			V_{CC} =6V	-	50	150	-	-	250	ns
Propagation Delay From Input ($\overline{OE}$) to Output (Q_A-Q_H)	t_{en}	C_L=50pF	V_{CC} =2V	-	40	135	-	-	225	ns
			V_{CC} =4.5V	-	15	27	-	-	45	ns
			V_{CC} =6V	-	13	23	-	-	38	ns
		C_L=150pF	V_{CC} =2V	-	70	200	-	-	250	ns
			V_{CC} =4.5V	-	23	40	-	-	50	ns
			V_{CC} =6V	-	19	34	-	-	43	ns
Propagation Delay From Input ($\overline{OE}$) to Output (Q_A-Q_H)	t_{dis}	C_L=50pF	V_{CC} =2V	-	41	150	-	-	250	ns
			V_{CC} =4.5V	-	15	30	-	-	50	ns
			V_{CC} =6V	-	12	26	-	-	43	ns
Output Transition Time (Q_A-Q_H)	t_t	C_L=50pF	V_{CC} =2V	-	28	60	-	-	75	ns
			V_{CC} =4.5V	-	8	12	-	-	15	ns
			V_{CC} =6V	-	6	10	-	-	13	ns
		C_L=150pF	V_{CC} =2V	-	45	210	-	-	265	ns
			V_{CC} =4.5V	-	17	42	-	-	53	ns
			V_{CC} =6V	-	13	36	-	-	45	ns
Output Transition Time (Q_H')		C_L=50pF	V_{CC} =2V	-	28	75	-	-	95	ns
			V_{CC} =4.5V	-	8	15	-	-	19	ns
			V_{CC} =6V	-	6	13	-	-	16	ns

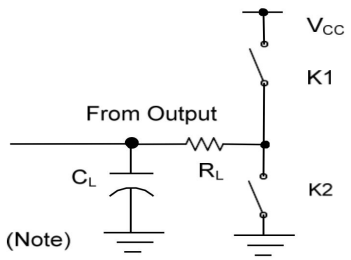
12. TIMING REQUIREMENTS

PARAMETER	SYMBOL	TEST CONDITIONS	T_A=25°C			T_A=-40°C~+125°C			UNIT
			MIN	TYP	MAX	MIN	TYP	MAX	
Pulse Duration, SRCLK or RCLK High or Low	t_W	V_{CC} =2V	80	-	-	110	-	-	ns
		V_{CC} =4.5V	16	-	-	22	-	-	ns
		V_{CC} =6V	14	-	-	19	-	-	ns
Pulse Duration, $\overline{SRCLR}$ Low		V_{CC} =2V	80	-	-	110	-	-	ns
		V_{CC} =4.5V	16	-	-	22	-	-	ns
		V_{CC} =6V	14	-	-	19	-	-	ns
Setup Time, SER Before SRCLK↑	t_{SU}	V_{CC} =2V	100	-	-	125	-	-	ns
		V_{CC} =4.5V	20	-	-	25	-	-	ns
		V_{CC} =6V	17	-	-	21	-	-	ns
Setup Time, SRCLK↑ Before RCLK↑		V_{CC} =2V	75	-	-	94	-	-	ns
		V_{CC} =4.5V	15	-	-	19	-	-	ns
		V_{CC} =6V	13	-	-	16	-	-	ns
Setup Time, $\overline{SRCLR}$ Low Before RCLK↑		V_{CC} =2V	50	-	-	65	-	-	ns
		V_{CC} =4.5V	10	-	-	13	-	-	ns
		V_{CC} =6V	9	-	-	11	-	-	ns
Setup Time, $\overline{SRCLR}$ High (inactive) Before SRCLK↑		V_{CC} =2V	50	-	-	60	-	-	ns
		V_{CC} =4.5V	10	-	-	12	-	-	ns
		V_{CC} =6V	9	-	-	11	-	-	ns
Hold Time, SER After SRCLK↑	t_H	V_{CC} =2V	3	-	-	3	-	-	ns
		V_{CC} =4.5V	3	-	-	3	-	-	ns
		V_{CC} =6V	3	-	-	3	-	-	ns

13. OPERATING CHARACTERISTIC

PARAMETER	SYMBOL	TEST CONDITIONS	MIN	TYP	MAX	UNIT
Input Capacitance	C_{IN}	V_{CC}=6V, V_{IN}=V_{CC} or GND	-	-	10	pF
Power Dissipation Capacitance	C_{PD}	No load	-	400	-	pF

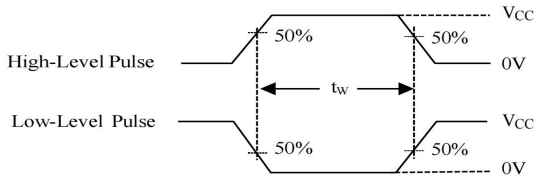
14. TEST CIRCUIT AND WAVEFORMS



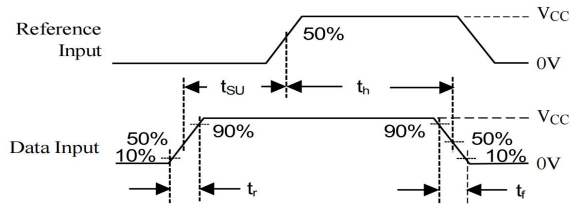
TEST	K1	K2
t_{PLH}/t_{PHL}	Open	Open
t_{PHZ}/t_{PZH}	Open	Close
t_{PLZ}/t_{PZL}	Close	Open

t_{PD} is the same as t_{PHL} and t_{PLH}.
t_{en} is the same as t_{PZL} and t_{PZH}.
t_{dis} is the same as t_{PLZ} and t_{PHZ}.

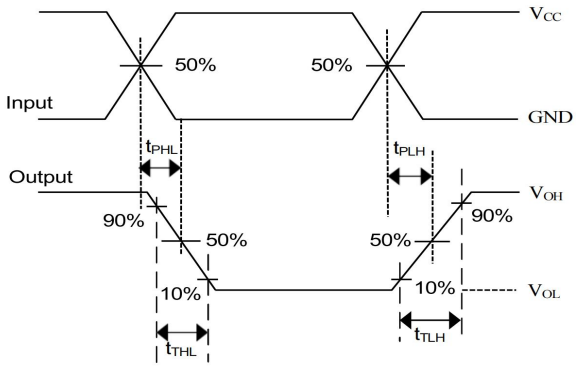
Note: C_L includes probe and jig capacitance. C_L=50pF or 150pF, R_L=1KΩ



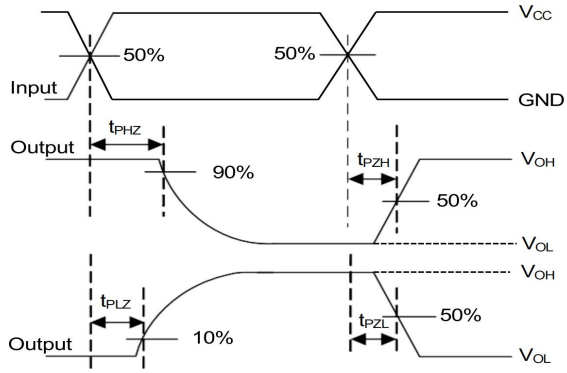
Voltage Waveforms, Pulse Duration



Voltage Waveforms



Voltage Waveforms Propagation Delays

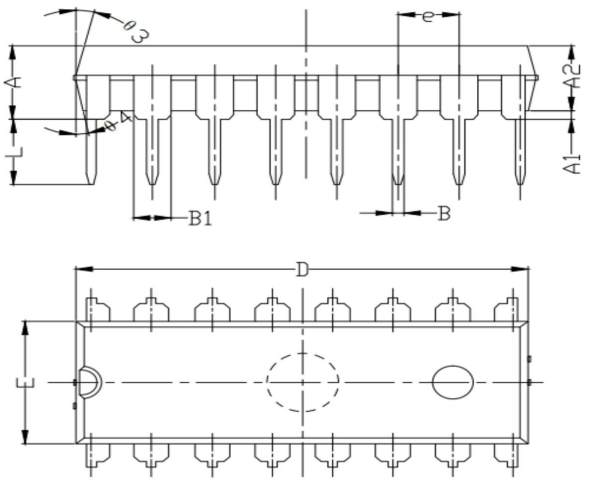


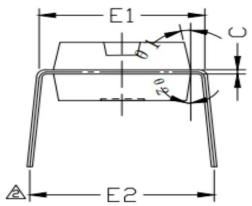
Voltage Waveforms Propagation Delays

Note: All input pulses are supplied by generators having the following characteristics: $P_{RR} \leq 1MHZ$, $Z_O = 50\Omega$, $t_r \leq 3ns$, $t_f \leq 3ns$.

15. PACKAGE INFORMATION

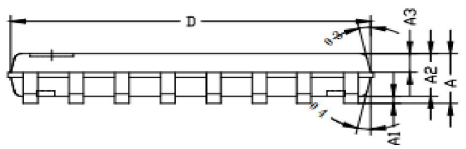
DIP16 package information

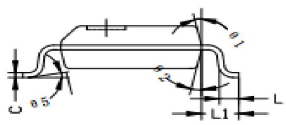


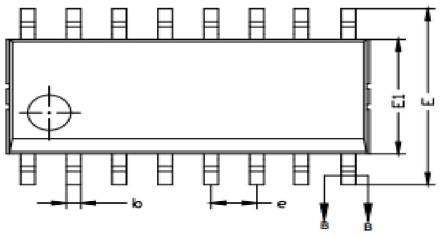


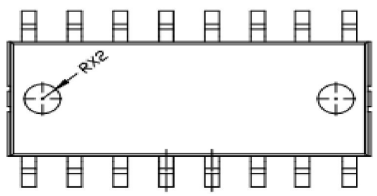
SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	3.75	3.90	4.05
A1	0.51	--	--
A2	3.20	3.30	3.45
B	0.38	0.48	0.56
B1	1.52(BSC)		
C	0.20	0.25	0.34
D	18.80	19.05	19.30
E	6.20	6.35	6.50
E1	7.35	7.62	7.85
e	2.54(BSC)		
L	3.00	3.30	3.60
E2	8.00	8.40	8.80
θ1	9°	~	15°
θ2	7°	~	13°
θ3	8°	~	14°
θ4	5°	~	12°

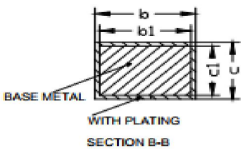
SOP16 package information





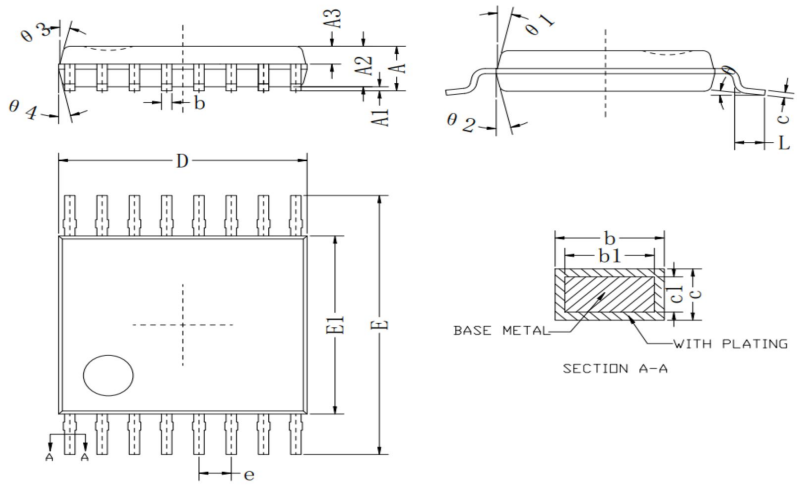






SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	--	--	1.70
A1	0.10	0.15	0.21
A2	1.40	1.45	1.50
A3	0.60	0.65	0.70
b	0.33	--	0.47
b1	0.32	0.41	0.44
c	0.20	--	0.24
c1	0.19	0.20	0.21
D	9.50	9.90	10.05
E	5.80	6.00	6.20
E1	3.85	3.90	4.00
e	1.27(BSC)		
L	0.50	0.60	0.70
L1	1.10(BSC)		
θ1	8°	~	15°
θ2	8°	~	15°
θ3	8°	~	15°
θ4	8°	~	15°
θ5	0°	~	6°
R	0.45°	0.50°	0.05°

TSSOP16 package information



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	--	--	1.20
A1	0.05	0.10	0.15
A2	0.80	1.00	1.05
A3	0.38	0.43	0.48
b	0.19	--	0.29
b1	0.16	0.22	0.26
c	0.13	--	0.15
c1	0.12	0.13	0.14
D	4.90	5.00	5.10
E	6.20	6.40	6.60
E1	4.30	4.40	4.50
e	0.65(BSC)		
L	0.45	0.60	0.75
θ	0°	~	8°
θ1	10°	~	14°
θ2	10°	~	14°
θ3	10°	~	14°
θ4	10°	~	14°