1.General Description

The EM74HC597; EM74HCT597 is an 8-bit shift register with input flip-flops. It consists of an 8-bit storage register feeding a parallel-in, serial-out 8-bit shift register. Both the storage register and the shift register have positive edge-triggered clocks. The shift register also has direct load (from storage) and clear inputs. Inputs include clamp diodes, this enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC}.

2.Features and Benefits

- Wide supply voltage range from 2.8 V to 6.0 V
- High noise immunity
- CMOS low power dissipation
- 8-bit parallel storage register inputs
- Shift register has direct overriding load and clear
- Latch-up performance exceeds 250 mA
- Complies with JEDEC standard:
  - JESD8C(2.8 V to 3.6 V)
  - JESD7A(2.8 V to 6.0 V)
- Input levels:
  - For EM74HC597: CMOS level
  - For EM74HCT597: TTL level
- ESD protection:
  - HBM ANSI/ESDA/JEDEC JS-001 Class 2 exceeds 3500 V
  - CDM ANSI/ESDA/JEDEC JS-002 Class C3 exceeds 2000 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

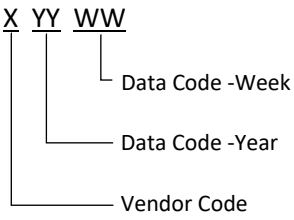
3.Ordering Information

Table 1. Ordering information

Type number	Topside marking	Package		
		Name	Description	Quantity
EM74HC597D	HC597 XYYWW	SOP-16L	plastic small outline package; 16 leads; body width 3.9 mm	3000
EM74HCT597D	HCT597 XYYWW			
EM74HC597PW	HC597 XYYWW	TSSOP-16L	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	3000
EM74HCT597PW	HCT597 XYYWW			

MARKING INFORMATION

NOTE: XYYWW = Vendor Code and Data Code.



4. Function Diagram

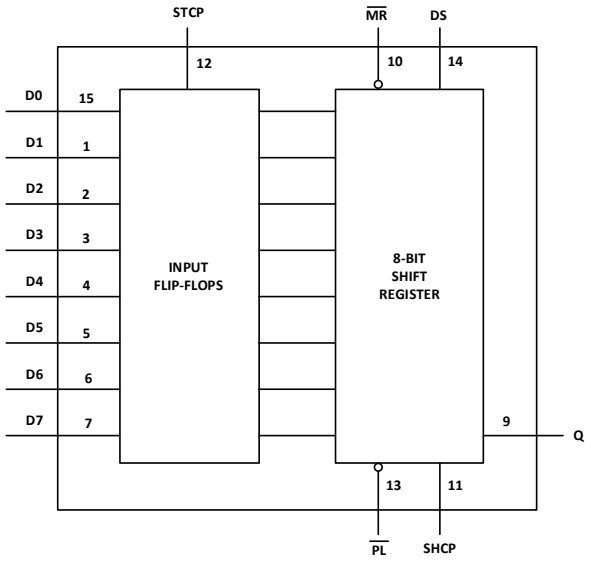


Fig. 1. Functional diagram

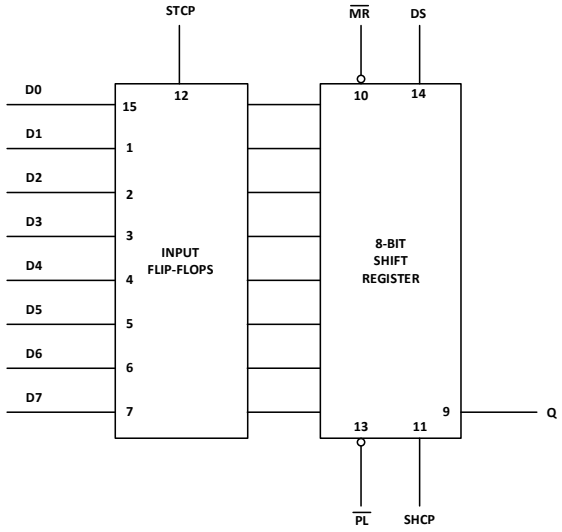


Fig. 2. Logic symbol

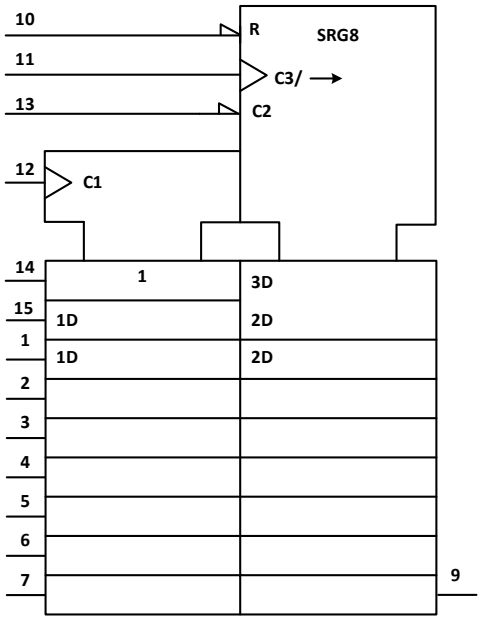


Fig. 3. IEC Logic symbol

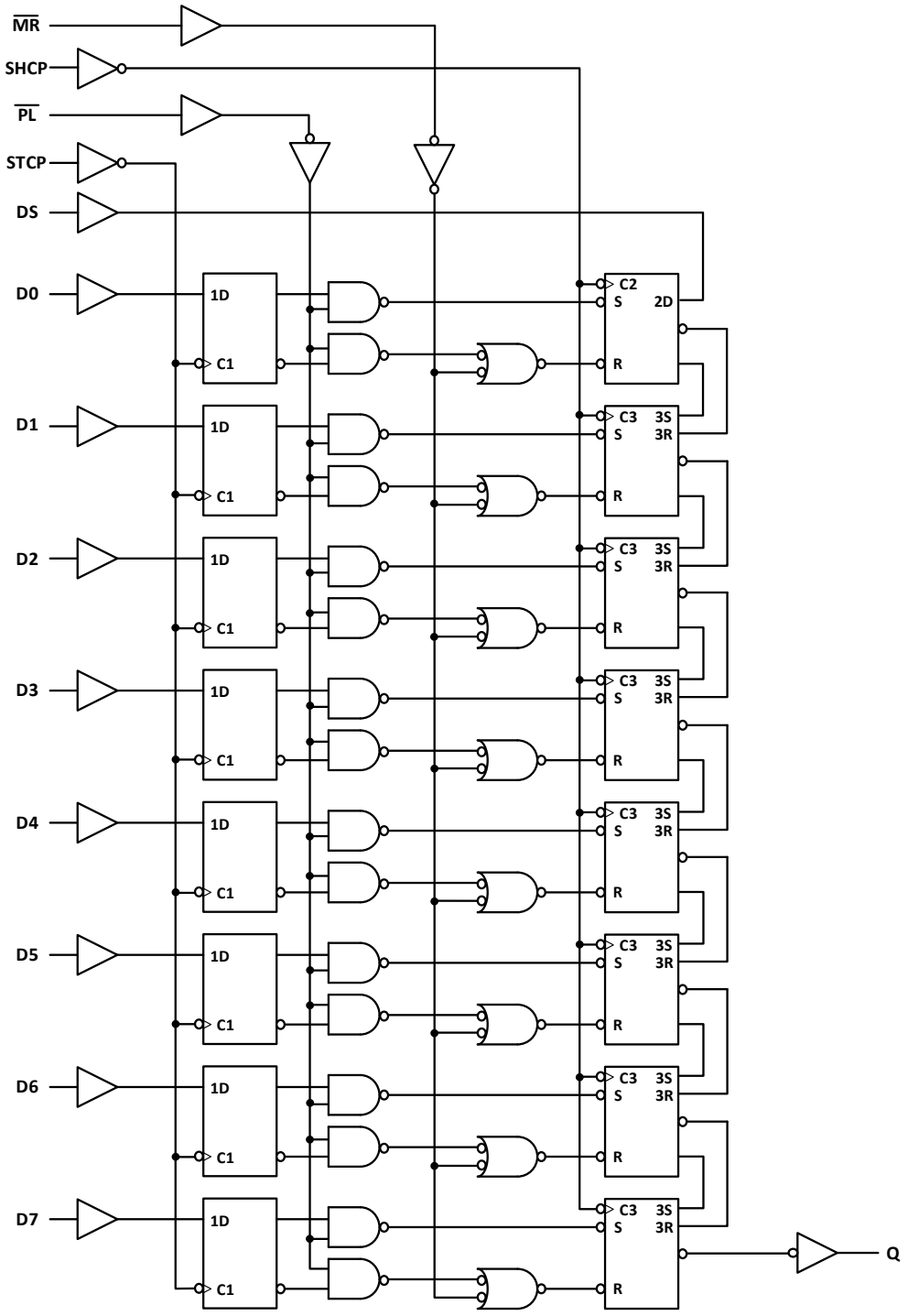


Fig. 4. Logic diagram

5.Pinning Information

5.1. Pinning

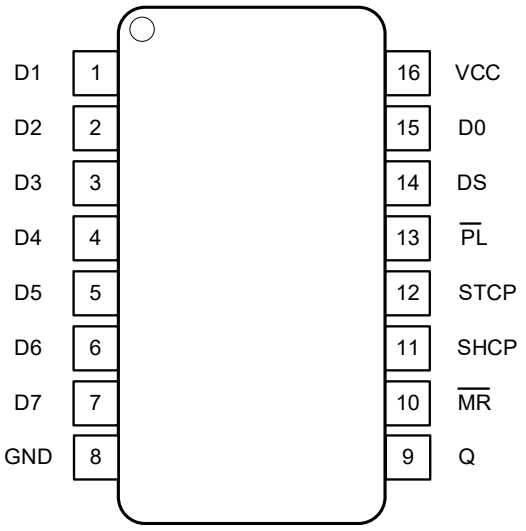


Fig. 5. Top view pin configuration SOP and TSSOP

5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
GND	8	ground(0V)
Q	9	serial data output
$\overline{MR}$	10	asynchronous master reset input (active LOW)
SHCP	11	shift register clock input (LOW-to-HIGH, edge-triggered)
STCP	12	storage register clock input (LOW-to-HIGH, edge-triggered)
$\overline{PL}$	13	parallel load input (active LOW)
DS	14	serial data input
D0,D1,D2,D3,D4,D5,D6,D7	15,1,2,3,4,5,6,7	parallel data inputs
V_{CC}	16	supply voltage

6.Functional Description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; ↑ = positive-going transition.

Inputs				Function
STCP	SHCP	$\overline{PL}$	$\overline{MR}$	
↑	X	X	X	data loaded to input latches
↑	X	L	H	data loaded from inputs to shift register
no clock edge	X	L	H	data transferred from input flip-flops to shift register
X	X	L	L	invalid logic, state of shift register is indeterminate when signals removed
X	X	H	L	shift register cleared
X	↑	H	H	shift register clocked Qn = Qn-1, Q0 = DS

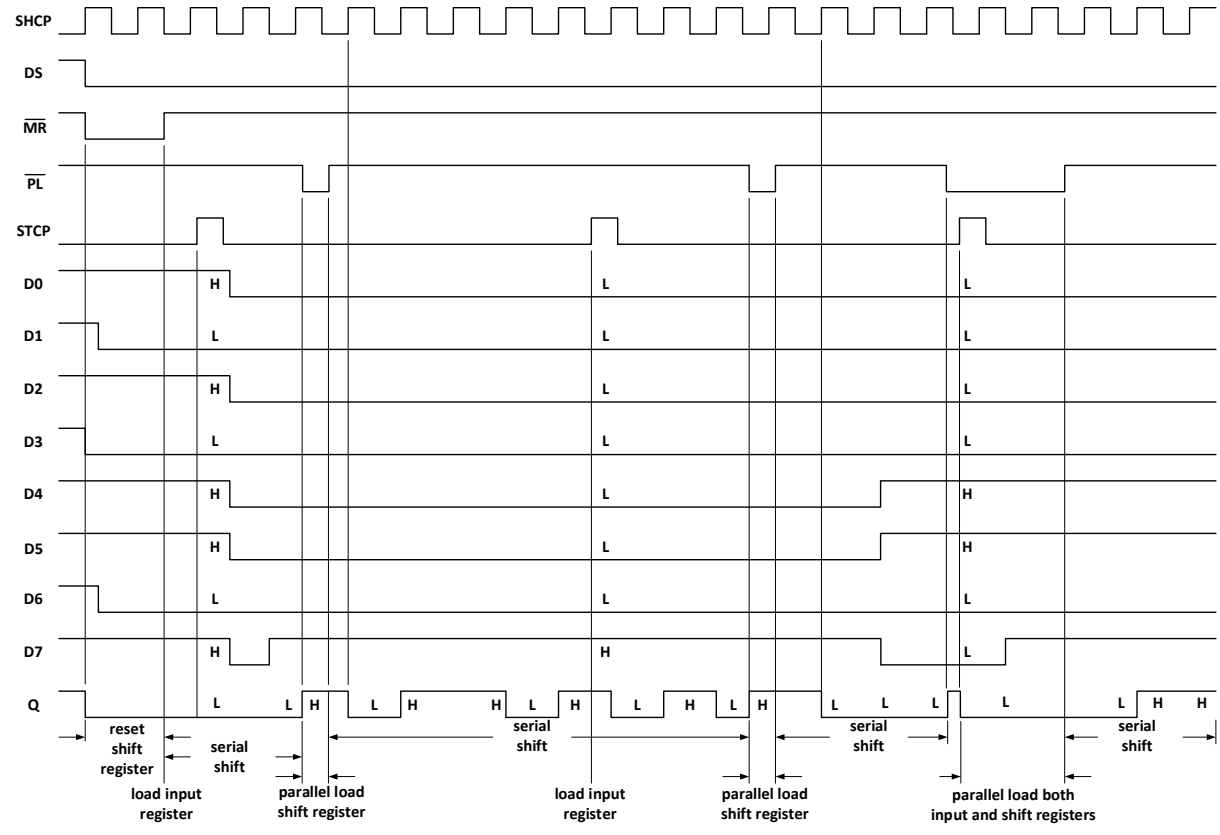


Fig. 6. Timing diagram

7.Absolute Maximum Ratings

Stresses exceeding the absolute maximum ratings may damage the device. The device may not function or be operable above the recommended operating conditions and stressing the parts to these levels is not recommended. In addition, extended exposure to stresses above the recommended operating conditions may affect device reliability. The absolute maximum ratings are stress ratings only.

Table 4. Absolute Maximum Ratings

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.5	7.0	V
I_{IK}	input clamping current	$V_I < -0.5$ V or $V_I > V_{CC} + 0.5$ V [1]		±20	mA
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{CC} + 0.5$ V [1]		±20	mA
I_O	output current	-0.5 V < V_O < V_{CC} + 0.5 V		±25	mA
I_{CC}	supply current			50	mA
I_{GND}	ground current		-50		mA
P_{tot}	total power dissipation	T_{amb} = -40 °C to + 125 °C		500	mW
T_{stg}	storage temperature		-65	150	°C

[1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

8.Recommended Operating Conditions

The Recommended Operating Conditions table defines the conditions for actual device operation. Recommended operating conditions are specified to ensure optimal performance to the datasheet specifications. EnergyMath does not recommend exceeding them or designing to Absolute Maximum Ratings.

Table 5. Recommended Operating Conditions

Symbol	Parameter	Conditions	EM74HC597			EM74HCT597			Unit
			Min	Typ	Max	Min	Typ	Max	
V_{CC}	supply voltage		2.8	5.0	6.0	4.5	5.0	5.5	V
V_I	input voltage		0		V_{CC}	0		V_{CC}	V
V_O	output voltage		0		V_{CC}	0		V_{CC}	V
T_{amb}	ambient temperature		-40	+25	+125	-40	+25	+125	°C
Δt/ΔV	input transition rise and fall rate	V_{CC} = 3.0 V			371				ns/V
		V_{CC} = 4.5 V		1.67	139		1.67	139	ns/V
		V_{CC} = 6.0 V			83				ns/V

9.Static Characteristics

Table 6. Static characteristics

At recommended operating conditions. Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
EM74HC597								
V_{IH}	HIGH-level input voltage	V_{CC} = 3.0 V	2.0	1.8		2.0		V
		V_{CC} = 4.5 V	3.15	2.4		3.15		V
		V_{CC} = 6.0 V	4.2	3.5		4.2		V
V_{IL}	LOW-level input voltage	V_{CC} = 3.0 V		1.3	0.6		0.6	V
		V_{CC} = 4.5 V		2.1	1.35		1.35	V
		V_{CC} = 6.0 V		2.8	1.8		1.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}						
		I_O = -20μA; V_{CC} = 3.0 V	2.9	3.0		2.9		V
		I_O = -20μA; V_{CC} = 4.5 V	4.4	4.5		4.4		V
		I_O = -20μA; V_{CC} = 6.0 V	5.9	6.0		5.9		V
		I_O = -4.0 mA; V_{CC} = 4.5 V	3.84	4.4		3.7		V
		I_O = -5.2 mA; V_{CC} = 6.0 V	5.34	5.9		5.2		V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}						
		I_O = 20μA; V_{CC} = 3.0 V		0	0.1		0.1	V
		I_O = 20μA; V_{CC} = 4.5 V		0	0.1		0.1	V
		I_O = 20μA; V_{CC} = 6.0 V		0	0.1		0.1	V
		I_O = 4.0 mA; V_{CC} = 4.5 V		0.04	0.33		0.4	V
		I_O = 5.2 mA; V_{CC} = 6.0 V		0.05	0.33		0.4	V
I_I	input leakage current	V_I = V_{CC} or GND ; V_{CC} = 6.0 V		0.1	±1		±1	μA
I_{CC}	supply current	V_I = V_{CC} or GND; I_O = 0A ; V_{CC} = 6.0 V		11	20		40	μA
C_I	input capacitance	Pin $\overline{PL}$, $\overline{MR}$		4.5				pF
		Pin DS, STCP,SHCP		8.0				pF
		Pin D0 to D7		9.5				pF

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
EM74HCT597								
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	1.7		2.0		V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V		1.4	0.8		0.8	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V						
		I_O = -20µA	4.4	4.5		4.4		V
		I_O = -4.0 mA	3.84	4.4		3.7		V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}; V_{CC} = 4.5 V						
		I_O = 20µA		0	0.1		0.1	V
		I_O = 4.0 mA		0.04	0.33		0.4	V
I_I	input leakage current	V_I = V_{CC} or GND ; V_{CC} = 5.5 V		0.1	±1		±1	µA
I_{CC}	supply current	V_I = V_{CC} or GND ; I_O = 0A ; V_{CC} = 5.5 V		11	20		40	µA
ΔI_{CC}	additional supply current	V_I = V_{CC} - 2.1 V; other inputs at V_{CC} or GND; V_{CC} = 4.5 V to 5.5 V; I_O = 0 A			450		490	µA
C_I	input capacitance	Pin $\overline{PL}$,$\overline{MR}$		4.5				pF
		Pin DS, STCP,SHCP		8.0				pF
		Pin D0 to D7		9.5				pF

[1]All typical values are measured at T_{amb} = 25°C.

10. Dynamic Characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Fig. 13.

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
EM74HC597								
t_{pd}	propagation delay	SHCP to Q; see Fig. 7 [2]						
		V_{CC} = 3.0 V			27		30	ns
		V_{CC} = 4.5 V			17		20	ns
		V_{CC} = 6.0 V			13		15	ns
		$\overline{MR}$ to Q; see Fig. 8 [2]						
		V_{CC} = 3.0 V			27		30	ns
		V_{CC} = 4.5 V			17		20	ns
		V_{CC} = 6.0 V			13		15	ns
		STCP to Q;see Fig. 7 [2]						
		V_{CC} = 3.0 V			27		30	ns
		V_{CC} = 4.5 V			17		20	ns
		V_{CC} = 6.0 V			13		15	ns
		$\overline{PL}$ to Q; see Fig. 9 [2]						
		V_{CC} = 3.0 V			27		30	ns
		V_{CC} = 4.5 V			17		20	ns
		V_{CC} = 6.0 V			13		15	ns
t_t	transition time	Q; see Fig. 9 [3]						
		V_{CC} = 3.0 V			8		10	ns
		V_{CC} = 4.5 V			7		9	ns
		V_{CC} = 6.0 V			7		9	ns
t_w	pulse width	STCP HIGH or LOW; see Fig. 7						
		V_{CC} = 3.0 V	25			31		ns
		V_{CC} = 4.5 V	20			24		ns
		V_{CC} = 6.0 V	17			20		ns
		SHCP HIGH or LOW; see Fig. 7						
		V_{CC} = 3.0 V	25			31		ns
		V_{CC} = 4.5 V	20			24		ns
		V_{CC} = 6.0 V	17			20		ns

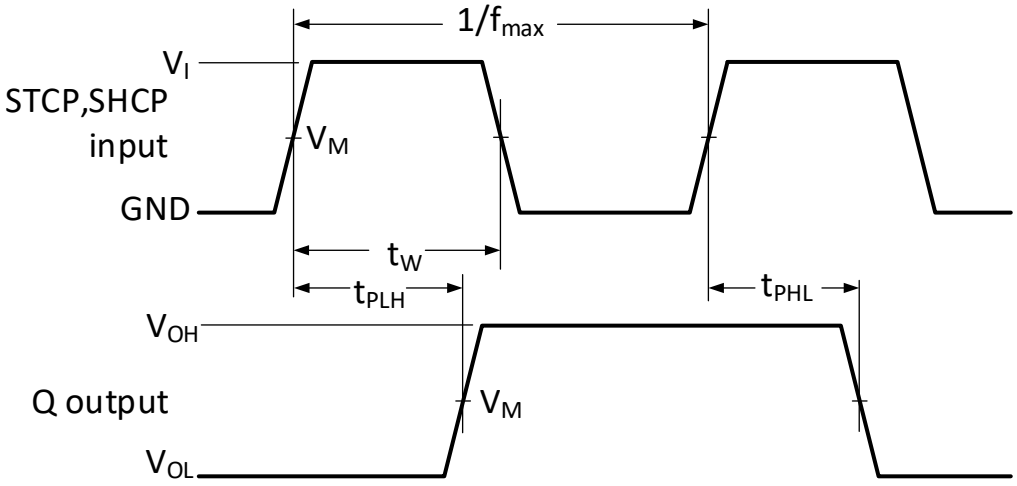
Symbol	Parameter	Conditions	-40 °C to +125 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t_w	pulse width	$\overline{MR}$ LOW; see Fig. 8						
		V_{CC} = 3.0 V	25			31		ns
		V_{CC} = 4.5 V	20			24		ns
		V_{CC} = 6.0 V	17			20		ns
		$\overline{PL}$ LOW; see Fig. 9						
		V_{CC} = 3.0 V	25			31		ns
		V_{CC} = 4.5 V	20			24		ns
		V_{CC} = 6.0 V	17			20		ns
t_{rec}	recovery time	$\overline{MR}$ to SHCP; see Fig. 10						
		V_{CC} = 3.0 V	20			23		ns
		V_{CC} = 4.5 V	15			18		ns
		V_{CC} = 6.0 V	13			15		ns
t_{su}	set-up time	Dn to STCP; see Fig. 11						
		V_{CC} = 3.0 V	20			23		ns
		V_{CC} = 4.5 V	15			18		ns
		V_{CC} = 6.0 V	13			15		ns
		DS to SHCP; see Fig. 11						
		V_{CC} = 3.0 V	20			23		ns
		V_{CC} = 4.5 V	15			18		ns
		V_{CC} = 6.0 V	13			15		ns
		$\overline{PL}$ to SHCP; see Fig. 12						
		V_{CC} = 3.0 V	20			23		ns
		V_{CC} = 4.5 V	15			18		ns
		V_{CC} = 6.0 V	13			15		ns
t_h	hold time	Dn to STCP; see Fig. 11						
		V_{CC} = 3.0 V	5			5		ns
		V_{CC} = 4.5 V	5			5		ns
		V_{CC} = 6.0 V	5			5		ns
		$\overline{PL}$,DS to SHCP; see Fig.11						
		V_{CC} = 3.0 V	5			5		ns
		V_{CC} = 4.5 V	5			5		ns
		V_{CC} = 6.0 V	5			5		ns

Symbol	Parameter	Conditions	-40 °C to +125 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
f_{max}	maximum frequency	SHCP; see Fig. 7						
		V_{CC} = 3.0 V	20			16		MHz
		V_{CC} = 4.5 V	24			20		MHz
		V_{CC} = 6.0 V	28			24		MHz
C_{PD}	power dissipation capacitance	f = 1 MHz; V_I = GND to V_{CC} ; [4]		26				pF
EM74HCT597								
t_{pd}	propagation delay	SHCP to Q; see Fig. 7 [2]						
		V_{CC} = 4.5 V			17		20	ns
		$\overline{MR}$ to Q; see Fig. 8 [2]						
		V_{CC} = 4.5 V			17		20	ns
		STCP to Q; see Fig. 7 [2]						
		V_{CC} = 4.5 V			17		20	ns
		$\overline{PL}$ to Q; see Fig. 9 [2]						
		V_{CC} = 4.5 V			17		20	ns
t_t	transition time	Q; see Fig. 9 [3]						
		V_{CC} = 4.5 V			7		9	ns
t_w	pulse width	STCP HIGH or LOW; see Fig. 7						
		V_{CC} = 4.5 V	20			24		ns
		SHCP HIGH or LOW; see Fig. 7						
		V_{CC} = 4.5 V	15			18		ns
		$\overline{MR}$ LOW; see Fig. 8						
		V_{CC} = 4.5 V	31			38		ns
		$\overline{PL}$ LOW; see Fig. 9						
		V_{CC} = 4.5 V	25			30		ns
t_{rec}	recovery time	$\overline{MR}$ to SHCP; see Fig. 10						
		V_{CC} = 4.5 V	15			18		ns
t_{su}	set-up time	Dn to STCP; see Fig. 11						
		V_{CC} = 4.5 V	15			18		ns
		DS to SHCP;see Fig. 11						
		V_{CC} = 4.5 V	15			18		ns
		$\overline{PL}$ to SHCP; see Fig. 12						
		V_{CC} = 4.5 V	15			18		ns

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	
t_h	hold time	Dn to STCP; see Fig. 11						
		V_{CC} = 4.5 V	5			5		ns
		$\overline{PL}$,DS to SHCP; see Fig.11						
		V_{CC} = 4.5 V	5			5		ns
f_{max}	maximum frequency	SHCP; see Fig. 7						
		V_{CC} = 4.5 V	24			20		MHz
C_{PD}	power dissipation capacitance	f = 1 MHz; V_I = GND to V_{CC} ; [4]		28				pF

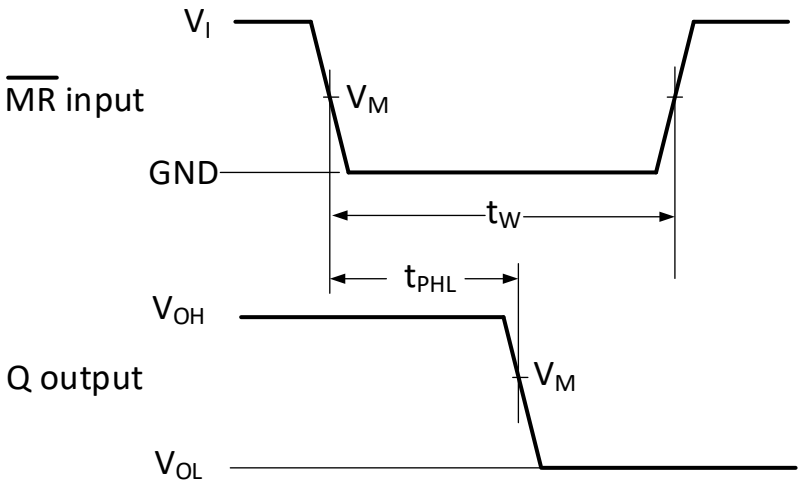
[1] Typical values are measured at T_{amb} = 25 °C.
[2] t_{pd} is the same as t_{PLH} and t_{PHL}.
[3] t_t is the same as t_{THL} and t_{TLH}.
[4] C_{PD} is used to determine the dynamic power dissipation (P_D in µW).
$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \Sigma(C_L \times V_{CC}^2 \times f_o)$ where:
f_i = input frequency in MHz;
f_o = output frequency in MHz;
C_L = output load capacitance in pF;
V_{CC} = supply voltage in V;
N = number of inputs switching;
$\Sigma(C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

11. Waveforms and test circuit



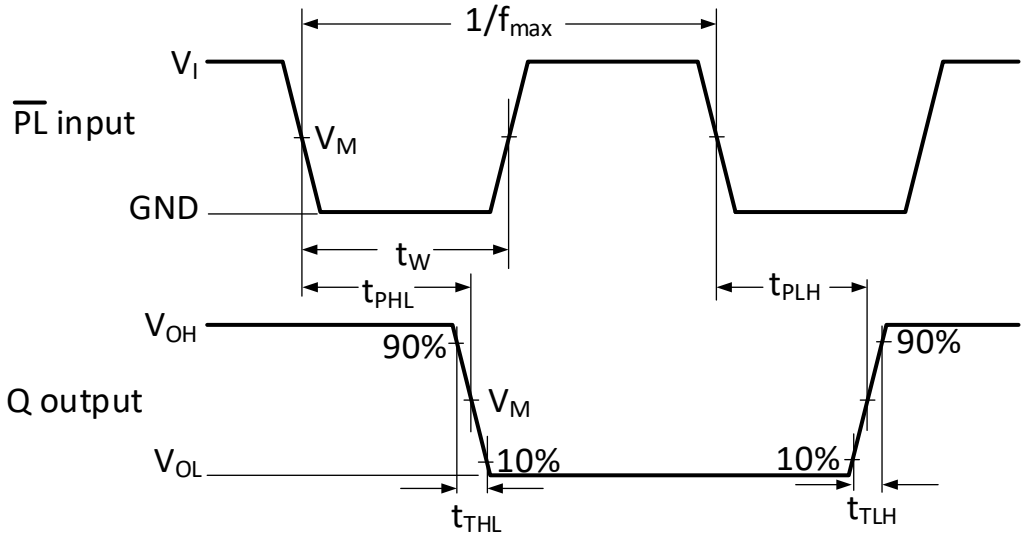
Measurement points are given in Table 8.
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 7. SHCP and STCP clock inputs to Q output propagation delays, pulse width and maximum clock frequency



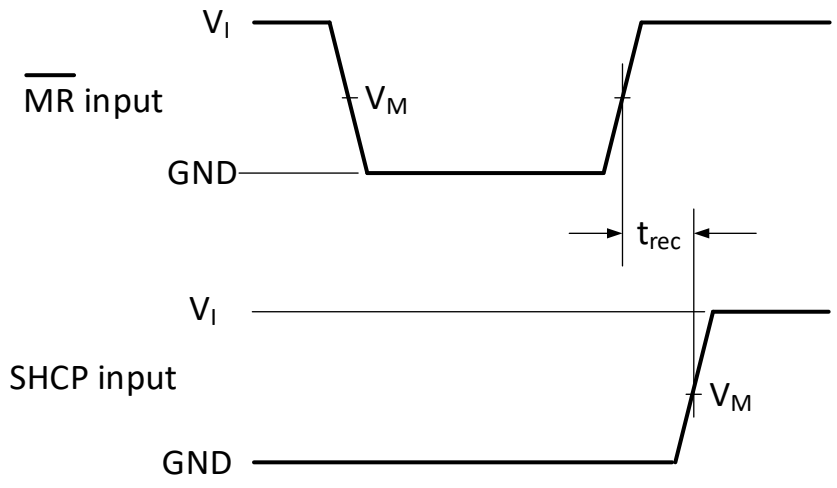
Measurement points are given in Table 8.
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 8. Input $\overline{MR}$ to Q output propagation delays and $\overline{MR}$ pulse width



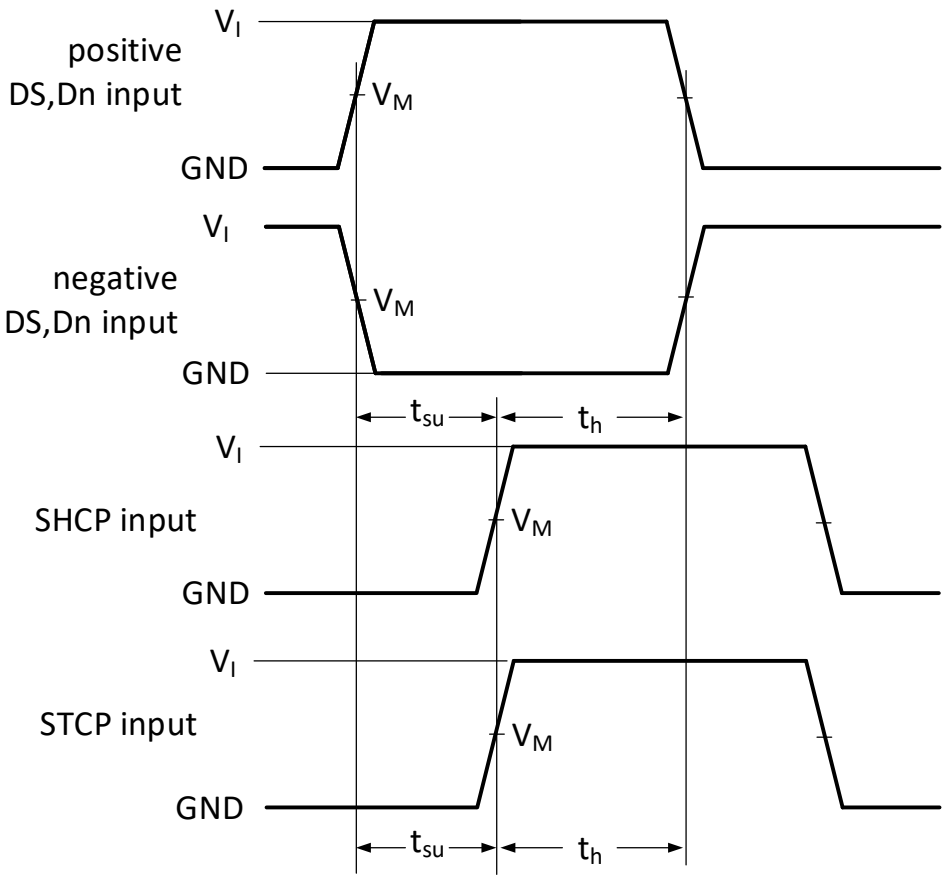
Measurement points are given in Table 8.
V_{OL} and V_{OH} are typical output voltage levels that occur with the output load.

Fig. 9. Input $\overline{PL}$ to Q output propagation delays, $\overline{PL}$ pulse width and output transition times



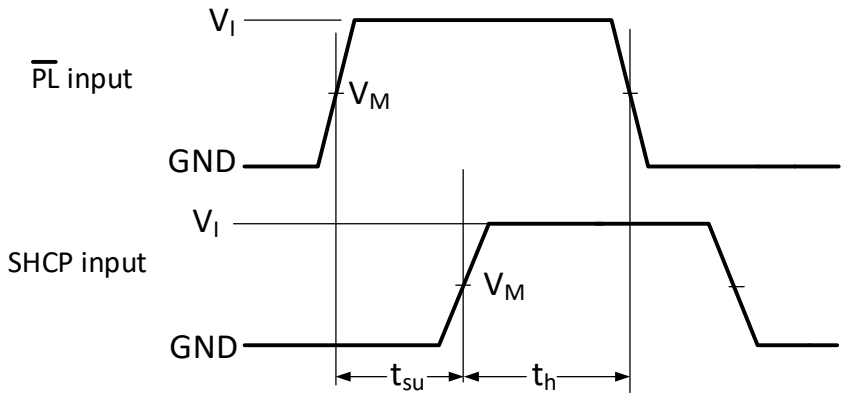
Measurement points are given in Table 8.

Fig. 10. Input $\overline{MR}$ to shift clock SHCP and storage clock STCP recovery times



Measurement points are given in Table 8.

Fig. 11. Set-up and hold times for DS, Dn inputs to SHCP, STCP inputs

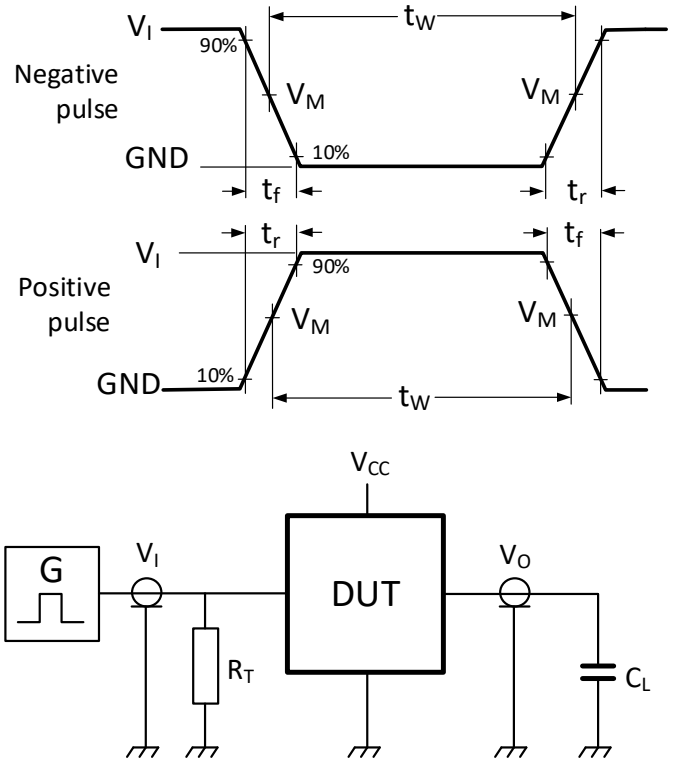


Measurement points are given in Table 8.

Fig. 12. Set-up and hold times for $\overline{PL}$ input to SHCP input

Table 8. Measurement points

Type	Input		Output
	V_M	V_I	V_M
EM74HC597	$0.5V_{CC}$	GND to V_{CC}	$0.5V_{CC}$
EM74HCT597	1.3 V	GND to 3 V	1.3 V



Test data is given in Table 9.
Definitions for test circuit:
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.

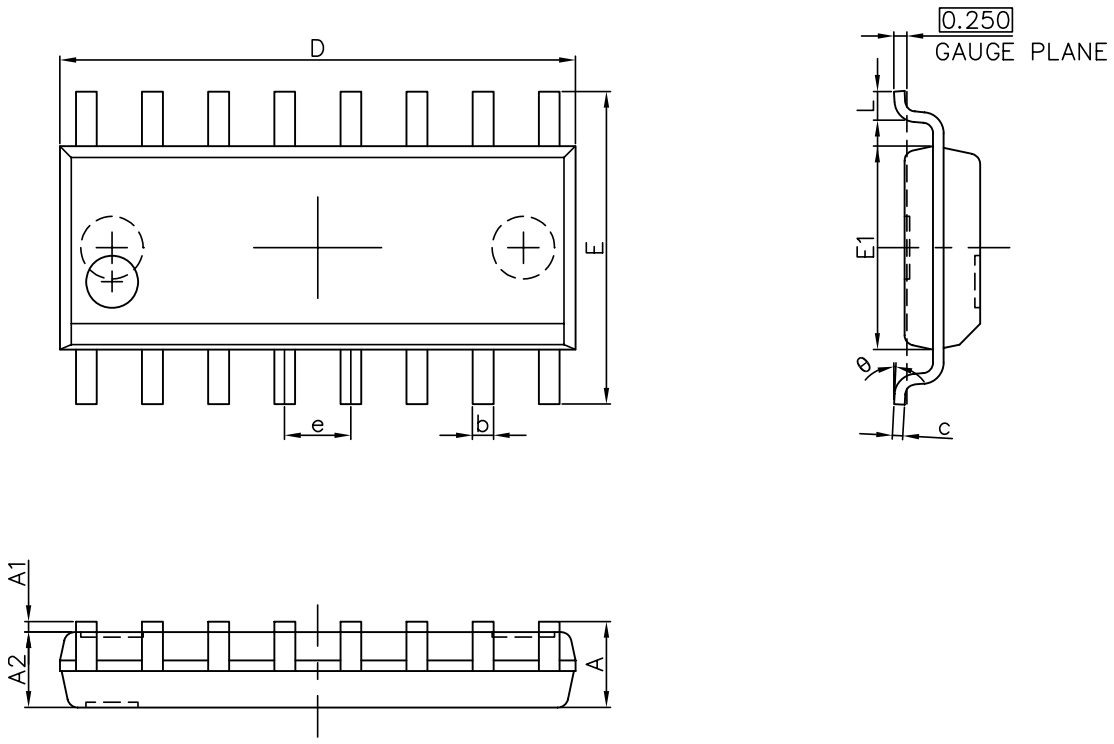
Fig. 13. Test circuit for measuring switching times

Table 9. Test data

Type	Input		Load	Test
	V_I	$t_r = t_f$	C_L	
EM74HC597	V_{CC}	2.5 ns	50 pF	t_{PHL}, t_{PLH}
EM74HCT597	3 V	2.5 ns	50 pF	t_{PHL}, t_{PLH}

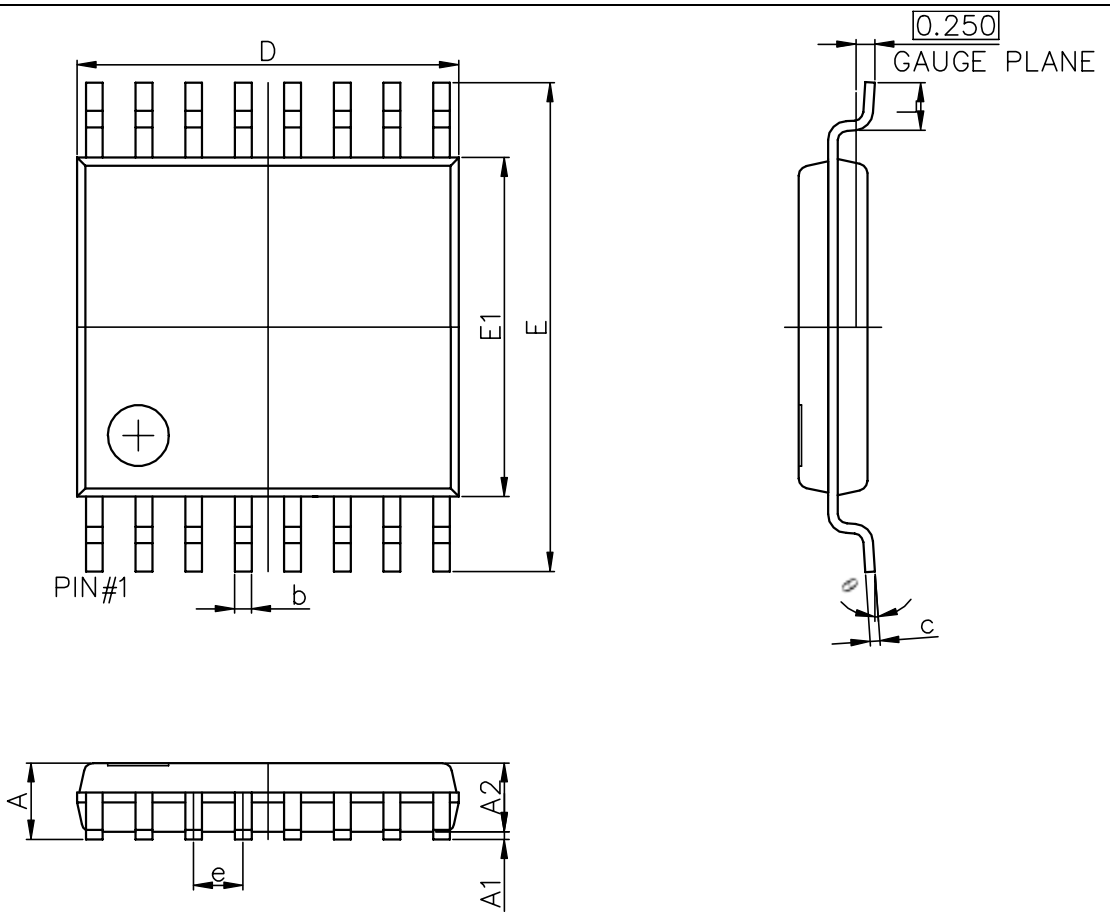
12. Package Outline

SOP-16L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	——	1.750	——	0.069
A1	0.150	0.250	0.006	0.010
A2	1.400	1.500	0.055	0.059
b	0.330	0.510	0.013	0.020
c	0.170	0.250	0.007	0.010
D	9.800	10.000	0.386	0.394
e	1.270(BSC)		0.050(BSC)	
E	5.900	6.100	0.232	0.240
E1	3.800	4.000	0.150	0.157
L	0.400	1.270	0.016	0.050
θ	0°	8°	0°	8°

TSSOP-16L



Symbol	Dimensions In Millimeters		Dimensions In Inches	
	Min.	Max.	Min.	Max.
A	——	1.200	——	0.047
A1	0.020	0.100	0.001	0.004
A2	0.800	1.000	0.031	0.039
b	0.190	0.300	0.007	0.012
c	0.090	0.200	0.004	0.008
D	4.900	5.100	0.193	0.201
e	0.650(BSC)		0.026(BSC)	
E	6.250	6.550	0.252(BSC)	
E1	4.300	4.500	0.169	0.177
L	0.500	0.700	0.020	0.028
θ	1°	7°	1°	7°

13. Abbreviations

Table 10. Abbreviations

Acronym	Description
CMOS	Complementary Metal-Oxide Semiconductor
TTL	Transistor-Transistor Logic
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
CDM	Charged Device Model

14. Revision History

Table 11. Revision history

Document ID	Release Date	Data sheet status	Change notice	Supersedes
EM74HC_HCT597 Rev. 1.0	Nov 29, 2024	Product datasheet		