74AHC594; 74AHCT594

8-bit shift register with output register

Rev. 02 — 9 June 2008 Product data sheet

1. General description

The 74AHC594; 74AHCT594 is a high-speed Si-gate CMOS device and is pin compatible with Low-Power Schottky TTL (LSTTL). It is specified in compliance with JEDEC standard No. 7-A.

The 74AHC594; 74AHCT594 is an 8-bit, non-inverting, serial-in, parallel-out shift register that feeds an 8-bit D-type storage register. Separate clocks (SHCP and STCP) and direct overriding clears ($\overline{SHR}$ and $\overline{STR}$) are provided on both the shift and storage registers. A serial output (Q7S) is provided for cascading purposes.

Both the shift and storage register clocks are positive-edge triggered. If the user wishes to connect both clocks together, the shift register will always be one count pulse ahead of the storage register.

2. Features

- Balanced propagation delays
- All inputs have Schmitt-trigger actions
- Inputs accept voltages higher than V_{CC}
- Wide supply voltage range from 2.0 V to 5.5 V
- 8-bit serial-in, parallel-out shift register with storage
- Independent direct overriding clears on shift and storage registers
- Independent clocks for shift and storage registers
- Latch-up performance exceeds 100 mA per JESD78 Class II
- Input levels:
  - For 74AHC594: CMOS level
  - For 74AHCT594: TTL level
- ESD protection:
  - HBM EIA/JESD22-A114E exceeds 2000 V
  - MM EIA/JESD22-A115-A exceeds 200 V
  - CDM EIA/JESD22-C101C exceeds 1000 V
- Multiple package options
- Specified from –40 °C to +85 °C and from –40 °C to +125 °C

3. Applications

- Serial-to parallel data conversion
- Remote control holding register

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4. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74AHC594				
74AHC594D	–40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74AHC594DB	–40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74AHC594PW	–40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74AHC594BQ	–40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1
74AHCT594				
74AHCT594D	–40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74AHCT594DB	–40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74AHCT594PW	–40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74AHCT594BQ	–40 °C to +125 °C	DHVQFN16	plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 × 3.5 × 0.85 mm	SOT763-1

5. Functional diagram

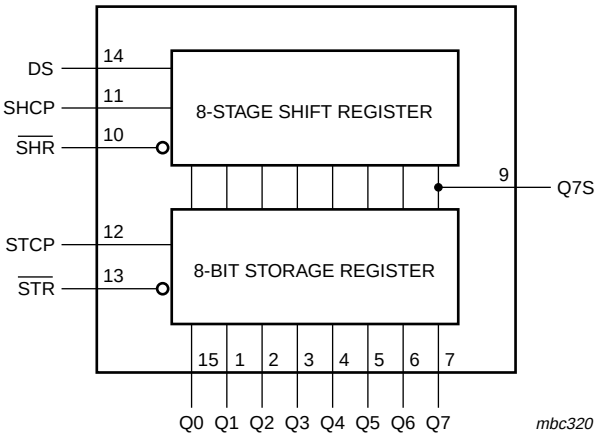


Fig 1. Functional diagram

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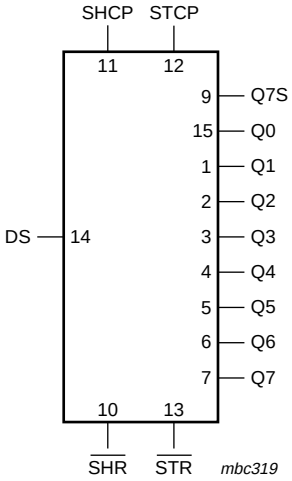


Fig 2. Logic symbol

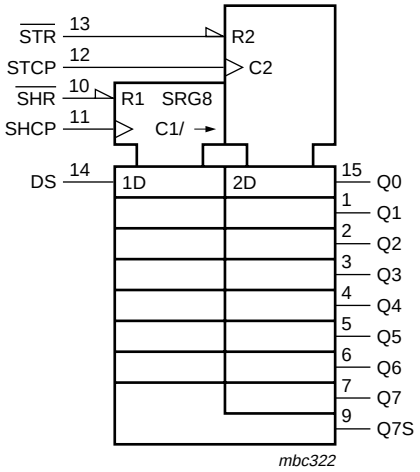


Fig 3. IEC logic symbol

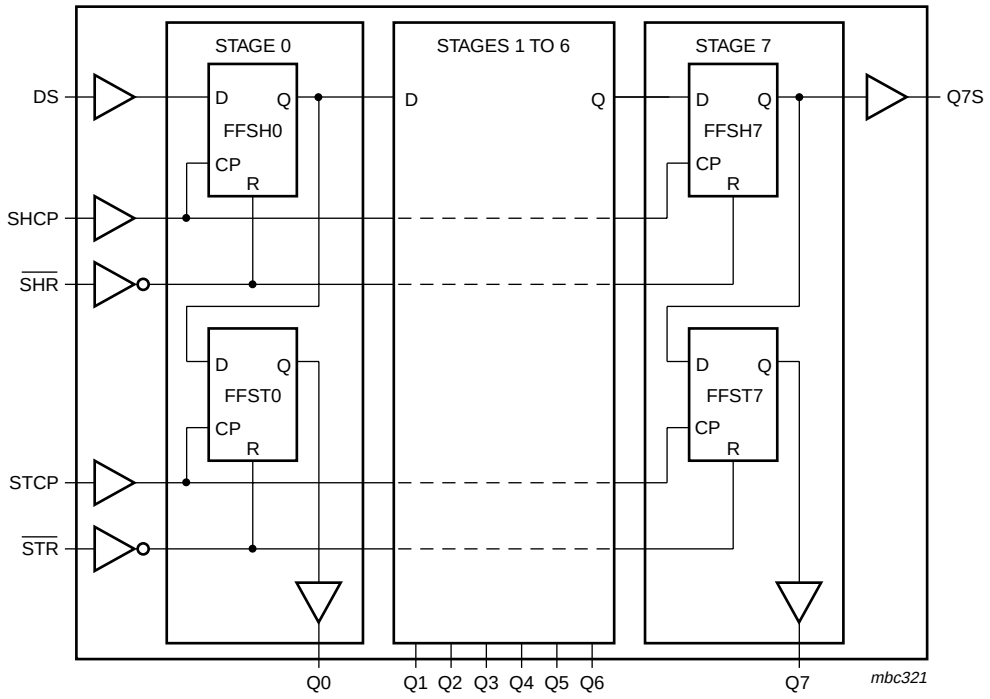


Fig 4. Logic diagram

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6. Pinning information

6.1 Pinning

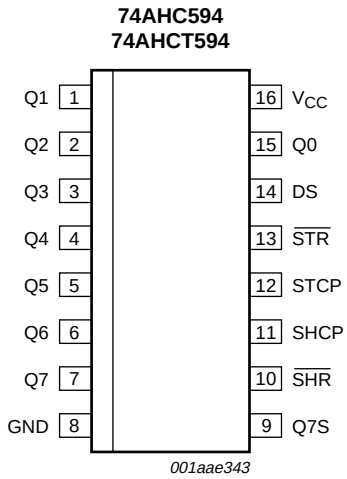


Fig 5. Pin configuration SO16

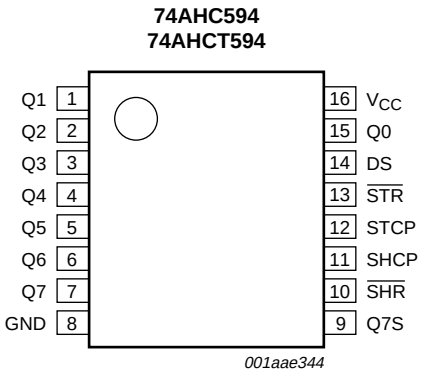
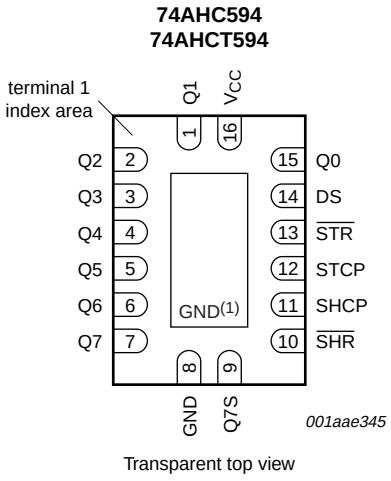


Fig 6. Pin configuration (T)SSOP16



Transparent top view

(1) The die substrate is attached to this pad using conductive die attach material. It can not be used as supply pin or input.

Fig 7. Pin configuration DHVQFN16

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6.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
Q1	1	parallel data output
Q2	2	parallel data output
Q3	3	parallel data output
Q4	4	parallel data output
Q5	5	parallel data output
Q6	6	parallel data output
Q7	7	parallel data output
GND	8	ground (0 V)
Q7S	9	serial data output
$\overline{SHR}$	10	shift register reset input (active LOW)
SHCP	11	shift register clock input
STCP	12	storage register clock input
$\overline{STR}$	13	storage register reset input (active LOW)
DS	14	serial data input
Q0	15	parallel data output
V_{CC}	16	supply voltage

7. Functional description

Table 3. Function table[1]

Input					Output		Function
SHCP	STCP	$\overline{SHR}$	$\overline{STR}$	DS	Q7S	Qn	
X	X	L	X	X	L	NC	a LOW-state on $\overline{SHR}$ only affects the shift register
X	X	X	L	X	NC	L	a LOW-state on $\overline{STR}$ only affects the storage register
X	↑	L	H	X	L	L	empty shift register loaded into storage register
↑	X	H	X	H	Q6S	NC	logic HIGH level shifted into shift register stage 0. Contents of all shift register stages shifted through, e.g. previous state of stage 6 (internal Q6S) appears on the serial output (Q7S).
X	↑	H	H	X	NC	QnS	contents of shift register stages (internal QnS) are transferred to the storage register and parallel output stages
↑	↑	H	H	X	Q6S	QnS	contents of shift register shifted through; previous contents of the shift register is transferred to the storage register and the parallel output stages

[1] H = HIGH voltage state;
L = LOW voltage state;
↑ = LOW to HIGH transition;
X = don't care;
NC = no change;

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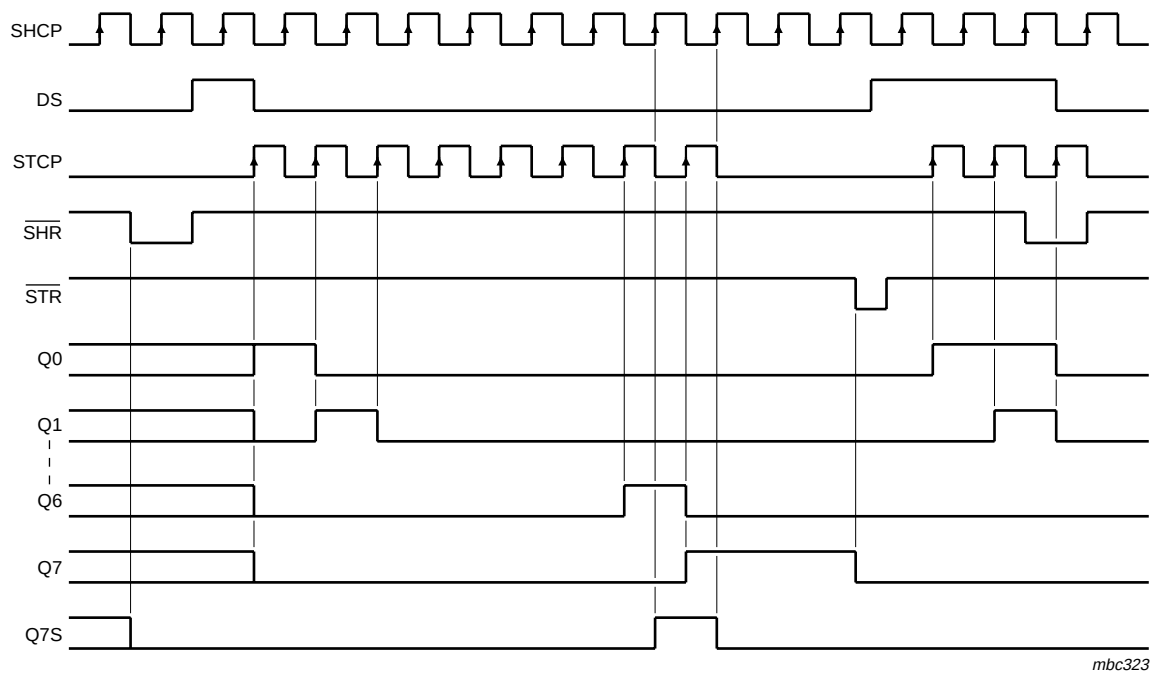


Fig 8. Timing diagram

8. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CC}	supply voltage			–0.5	+7.0	V
V_I	input voltage			–0.5	+7.0	V
I_{IK}	input clamping current	$V_I < –0.5$ V	[1]	–20	-	mA
I_{OK}	output clamping current	$V_O < –0.5$ V or $V_O > V_{CC} + 0.5$ V	[1]	–20	+20	mA
I_O	output current	$V_O = –0.5$ V to $(V_{CC} + 0.5$ V)		–25	+25	mA
I_{CC}	supply current			-	+75	mA
I_{GND}	ground current			–75	-	mA
T_{stg}	storage temperature			–65	+150	°C
P_{tot}	total power dissipation	$T_{amb} = –40$ °C to +125 °C	[2]	-	500	mW

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

[2] For SO16 packages: above 70 °C the value of P_{tot} derates linearly at 8 mW/K.
For (T)SSOP16 packages: above 60 °C the value of P_{tot} derates linearly at 5.5 mW/K.
For DHVQFN16 packages: above 60 °C the value of P_{tot} derates linearly at 4.5 mW/K.

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9. Recommended operating conditions

Table 5. Operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
74AHC594						
V_{CC}	supply voltage		2.0	5.0	5.5	V
V_I	input voltage		0	-	5.5	V
V_O	output voltage		0	-	V_{CC}	V
T_{amb}	ambient temperature		–40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 3.0 V to 3.6 V	-	-	100	ns/V
		V_{CC} = 4.5 V to 5.5 V	-	-	20	ns/V
74AHCT594						
V_{CC}	supply voltage		4.5	5.0	5.5	V
V_I	input voltage		0	-	5.5	V
V_O	output voltage		0	-	V_{CC}	V
T_{amb}	ambient temperature		–40	+25	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	V_{CC} = 4.5 V to 5.5 V	-	-	20	ns/V

10. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
74AHC594										
V_{IH}	HIGH-level input voltage	V_{CC} = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
		V_{CC} = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V_{CC} = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
		V_{CC} = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V_{CC} = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V_{OH}	HIGH-level output voltage	V_I = V_{IH} or V_{IL}								
		I_O = –50 µA; V_{CC} = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I_O = –50 µA; V_{CC} = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I_O = –50 µA; V_{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = –4.0 mA; V_{CC} = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
		I_O = –8.0 mA; V_{CC} = 4.5 V	3.94	-	-	3.80	-	3.70	-	V
V_{OL}	LOW-level output voltage	V_I = V_{IH} or V_{IL}								
		I_O = 50 µA; V_{CC} = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 50 µA; V_{CC} = 3.0 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 50 µA; V_{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 4 mA; V_{CC} = 3.0 V	-	-	0.36	-	0.44	-	0.55	V
		I_O = 8 mA; V_{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	V

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Table 6. Static characteristics *…continued*

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

Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
I_I	input leakage current	V_I = 5.5 V or GND; V_{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	µA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	4.0	-	40	-	80	µA
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	3	10	-	10	-	10	pF
74AHCT594										
V_{IH}	HIGH-level input voltage	V_{CC} = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V_{IL}	LOW-level input voltage	V_{CC} = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V_{OH}	HIGH-level output voltage	$V_I = V_{IH}$ or V_{IL}								
		I_O = –50 µA; V_{CC} = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I_O = –8.0 mA; V_{CC} = 4.5 V	3.94	-	-	3.80	-	3.70	-	V
V_{OL}	LOW-level output voltage	$V_I = V_{IH}$ or V_{IL}								
		I_O = 50 µA; V_{CC} = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I_O = 8 mA; V_{CC} = 4.5 V	-	-	0.36	-	0.44	-	0.55	V
I_I	input leakage current	V_I = 5.5 V or GND; V_{CC} = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	µA
I_{CC}	supply current	$V_I = V_{CC}$ or GND; I_O = 0 A; V_{CC} = 5.5 V	-	-	4.0	-	40	-	80	µA
ΔI_{CC}	additional supply current	per input pin; $V_I = V_{CC}$ – 2.1 V; other pins at V_{CC} or GND; I_O = 0 A; V_{CC} = 4.5 V to 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C_I	input capacitance	$V_I = V_{CC}$ or GND	-	3	10	-	10	-	10	pF

11. Dynamic characteristics

Table 7. Dynamic characteristics

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 15.

Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
74AHC594										
t_{PLH}	LOW to HIGH propagation delay	SHCP to Q7S; see Figure 9								
		V_{CC} = 3.0 V to 3.6 V								
		C_L = 15 pF	-	5.2	8.5	2.2	9.7	2.2	10.6	ns
		C_L = 50 pF	-	7.4	11.5	3.0	13.2	3.0	14.3	ns
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	3.8	6.3	1.7	7.2	1.7	7.8	ns
		C_L = 50 pF	-	4.8	8.0	2.4	9.1	2.4	10.0	ns

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Table 7. Dynamic characteristics *…continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 15.

Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
		STCP to Qn; see Figure 10								
		V_{CC} = 3.0 V to 3.6 V								
		C_L = 15 pF	-	5.1	8.3	2.3	9.5	2.3	10.6	ns
		C_L = 50 pF	-	7.3	11.9	3.3	13.6	3.3	14.7	ns
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	3.5	5.7	1.8	6.5	1.8	7.1	ns
		C_L = 50 pF	-	4.8	7.8	2.6	9.0	2.6	9.8	ns
t_{PHL}	HIGH to LOW propagation delay	SHCP to Q7S; see Figure 9								
		V_{CC} = 3.0 V to 3.6 V								
		C_L = 15 pF	-	5.5	8.9	2.3	10.2	2.3	11.0	ns
		C_L = 50 pF	-	7.4	12.1	3.0	13.9	3.0	15.1	ns
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	4.1	6.7	1.9	7.6	1.9	8.2	ns
		C_L = 50 pF	-	5.4	8.8	2.5	10.1	2.5	11.0	ns
		STCP to Qn; see Figure 10								
		V_{CC} = 3.0 V to 3.6 V								
		C_L = 15 pF	-	5.5	9.1	2.4	10.4	2.4	11.3	ns
		C_L = 50 pF	-	7.3	12.0	3.2	13.8	3.2	15.0	ns
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	3.7	6.0	1.9	6.9	1.9	7.5	ns
		C_L = 50 pF	-	5.2	8.5	2.6	9.7	2.6	10.5	ns
		$\overline{SHR}$ to Q7S; see Figure 13								
		V_{CC} = 3.0 V to 3.6 V								
		C_L = 15 pF	-	5.7	9.5	2.3	10.8	2.3	11.7	ns
		C_L = 50 pF	-	7.5	12.2	3.6	14.0	3.6	15.2	ns
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	4.1	6.7	2.0	7.6	2.0	8.2	ns
		C_L = 50 pF	-	5.4	8.8	2.8	10.1	2.8	11.0	ns
		$\overline{STR}$ to Qn; see Figure 14								
		V_{CC} = 3.0 V to 3.6 V								
		C_L = 15 pF	-	5.8	9.6	2.8	11.0	2.8	12.0	ns
		C_L = 50 pF	-	7.7	12.5	3.8	14.4	3.8	15.6	ns
		V_{CC} = 4.5 V to 5.5 V								
		C_L = 15 pF	-	4.1	7.2	2.2	8.2	2.2	8.9	ns
		C_L = 50 pF	-	5.4	9.4	3.0	10.7	3.0	11.6	ns
f_{max}	maximum frequency	SHCP or STCP; see Figure 9 and 10								
		V_{CC} = 3.0 V to 3.6 V	80	125	-	70	-	65	-	MHz
		V_{CC} = 4.5 V to 5.5 V	90	170	-	80	-	70	-	MHz

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Table 7. Dynamic characteristics *…continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 15.

Symbol	Parameter	Conditions		25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
				Min	Typ[1]	Max	Min	Max	Min	Max	
t_W	pulse width	SHCP and STCP HIGH or LOW; see Figure 9 and 10									
		V_{CC} = 3.0 V to 3.6 V		6.0	-	-	6.5	-	7.0	-	ns
		V_{CC} = 4.5 V to 5.5 V		5.5	-	-	6.0	-	6.5	-	ns
		$\overline{SHR}$ and $\overline{STR}$ HIGH or LOW; see Figure 13 and 14									
		V_{CC} = 3.0 V to 3.6 V		5.0	-	-	5.0	-	5.5	-	ns
		V_{CC} = 4.5 V to 5.5 V		5.0	-	-	5.2	-	5.7	-	ns
t_{su}	set-up time	DS to SHCP; see Figure 11									
		V_{CC} = 3.0 V to 3.6 V		3.5	-	-	3.5	-	4.0	-	ns
		V_{CC} = 4.5 V to 5.5 V		3.0	-	-	3.0	-	3.5	-	ns
		$\overline{SHR}$ to STCP; see Figure 12									
		V_{CC} = 3.0 V to 3.6 V		8.0	-	-	9.0	-	9.5	-	ns
		V_{CC} = 4.5 V to 5.5 V		5.0	-	-	5.0	-	5.5	-	ns
		SHCP to STCP; see Figure 10									
		V_{CC} = 3.0 V to 3.6 V		8.0	-	-	8.5	-	9.0	-	ns
		V_{CC} = 4.5 V to 5.5 V		5.0	-	-	5.0	-	5.5	-	ns
t_h	hold time	DS to SHCP; see Figure 11									
		V_{CC} = 3.0 V to 3.6 V		1.5	-	-	1.5	-	2.0	-	ns
		V_{CC} = 4.5 V to 5.5 V		2.0	-	-	2.0	-	2.5	-	ns
t_{rec}	recovery time	$\overline{SHR}$ to SHCP; see Figure 13									
		V_{CC} = 3.0 V to 3.6 V		4.2	-	-	4.8	-	5.3	-	ns
		V_{CC} = 4.5 V to 5.5 V		2.9	-	-	3.3	-	3.8	-	ns
		$\overline{STR}$ to STCP; see Figure 14									
		V_{CC} = 3.0 V to 3.6 V		4.6	-	-	5.3	-	5.8	-	ns
		V_{CC} = 4.5 V to 5.5 V		3.2	-	-	3.7	-	4.3	-	ns
C_{PD}	power dissipation capacitance	f_i = 1 MHz; V_I = GND to V_{CC}	[2]	-	55	-	-	-	-	-	pF
74AHCT594; V_{CC} = 4.5 V to 5.5 V											
t_{PLH}	LOW to HIGH propagation delay	SHCP to Q7S; see Figure 9									
		C_L = 15 pF		-	3.8	6.3	1.7	7.2	1.7	7.8	ns
		C_L = 50 pF		-	4.8	8.0	2.2	9.1	2.2	9.9	ns
		STCP to Qn; see Figure 10									
		C_L = 15 pF		-	3.5	5.7	1.8	6.5	1.8	7.1	ns
		C_L = 50 pF		-	4.6	7.7	2.6	8.8	2.6	9.6	ns

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Table 7. Dynamic characteristics *…continued*

Voltages are referenced to GND (ground = 0 V); for test circuit see Figure 15.

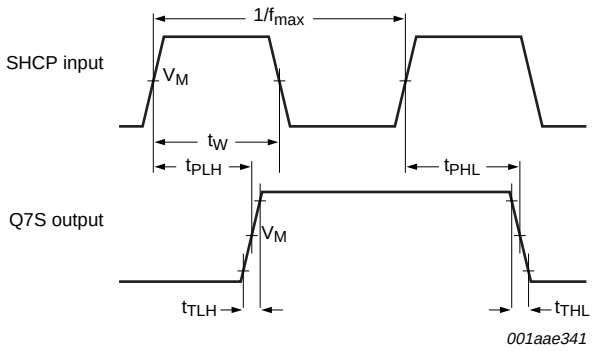
Symbol	Parameter	Conditions	25 °C			–40 °C to +85 °C		–40 °C to +125 °C		Unit
			Min	Typ[1]	Max	Min	Max	Min	Max	
t_{PHL}	HIGH to LOW propagation delay	SHCP to Q7S; see Figure 9								
		C_L = 15 pF	-	4.1	6.7	1.8	7.6	1.8	8.3	ns
		C_L = 50 pF	-	5.4	8.8	2.4	10.1	2.4	11.0	ns
		STCP to Qn; see Figure 10								
		C_L = 15 pF	-	3.7	6.1	1.9	6.9	1.9	7.2	ns
		C_L = 50 pF	-	5.2	8.5	2.6	9.7	2.6	10.5	ns
		$\overline{SHR}$ to Q7S; see Figure 13								
		C_L = 15 pF	-	4.3	7.0	2.4	8.0	2.4	8.7	ns
		C_L = 50 pF	-	5.4	8.8	2.7	10.1	2.7	11.0	ns
		$\overline{STR}$ to Qn; see Figure 14								
		C_L = 15 pF	-	4.5	7.4	2.3	8.4	2.3	9.2	ns
		C_L = 50 pF	-	5.7	9.4	3.1	10.7	3.1	11.7	ns
f_{max}	maximum frequency	SHCP or STCP; see Figure 9 and 10	90	160	-	80	-	70	-	MHz
t_W	pulse width	SHCP and STCP HIGH or LOW; see Figure 9 and 10	5.5	-	-	6.0	-	6.5	-	ns
		$\overline{SHR}$ and $\overline{STR}$ HIGH or LOW; see Figure 13 and 14	5.2	-	-	5.5	-	6.0	-	ns
t_{su}	set-up time	DS to SHCP; see Figure 11	3.0	-	-	3.0	-	3.5	-	ns
		$\overline{SHR}$ to STCP; see Figure 12	5.0	-	-	5.0	-	5.5	-	ns
		SHCP to STCP; see Figure 10	5.0	-	-	5.0	-	5.5	-	ns
t_h	hold time	DS to SHCP; see Figure 11	2.0	-	-	2.0	-	2.5	-	ns
t_{rec}	recovery time	$\overline{SHR}$ to SHCP; see Figure 13	2.9	-	-	3.3	-	3.8	-	ns
		$\overline{STR}$ to STCP; see Figure 14	3.4	-	-	3.8	-	4.3	-	ns
C_{PD}	power dissipation capacitance	f_i = 1 MHz; V_I = GND to V_{CC} [2]	-	55	-	-	-	-	-	pF

[1] Typical values are measured at nominal supply voltage (V_{CC} = 3.3 V and V_{CC} = 5.0 V).

[2] 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 the outputs.

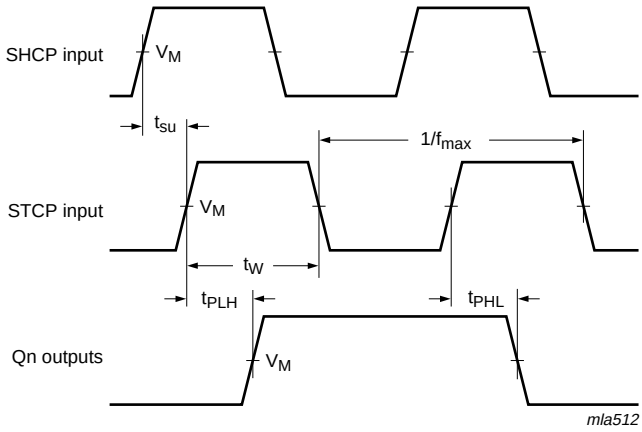
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12. Waveforms



Measurement points are given in Table 8.

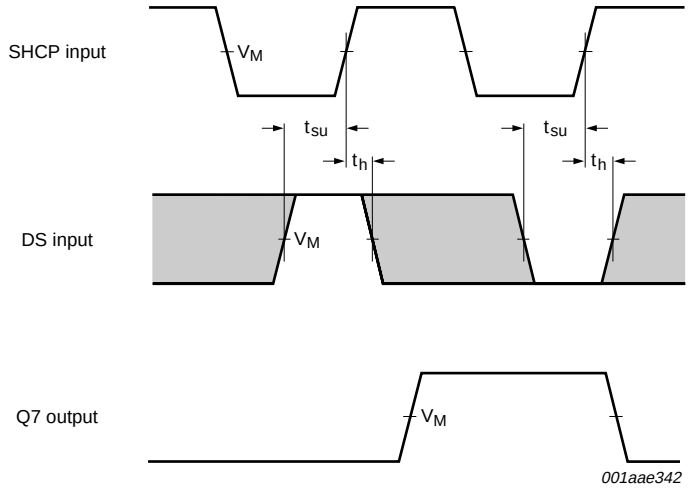
Fig 9. Shift register clock pulse width, maximum frequency and input to output propagation delays



Measurement points are given in Table 8.

Fig 10. Shift register clock to storage register clock set-up time and storage clock pulse width, maximum frequency and input to output propagation delays

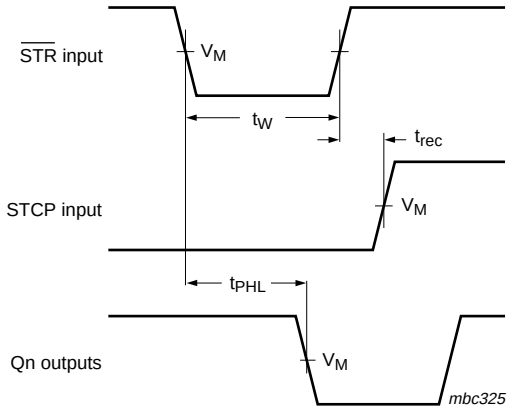
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Measurement points are given in Table 8.

The shaded areas indicate when the input is permitted to change for predictable output performance.

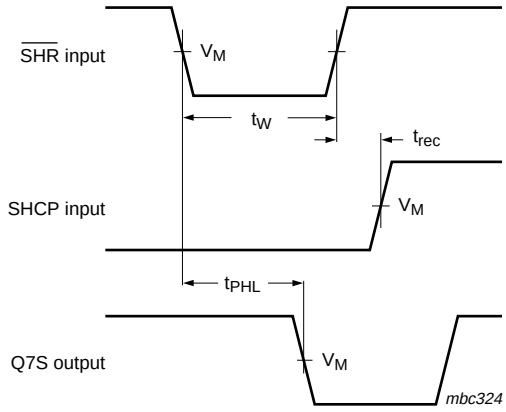
Fig 11. Shift register clock to data input set-up and hold times



Measurement points are given in Table 8.

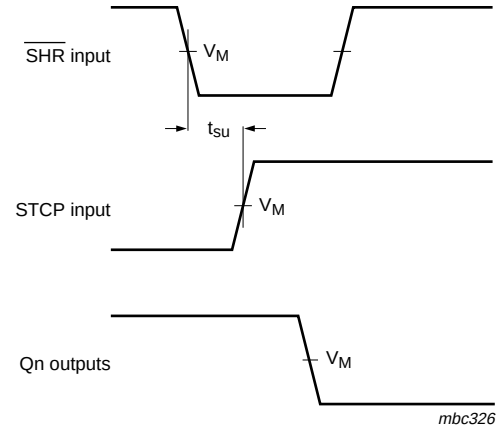
Fig 12. Storage register reset pulse width, input to output propagation delay and recovery time

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Measurement points are given in Table 8.

Fig 13. Shift register reset pulse width, input to output propagation delay and recovery time



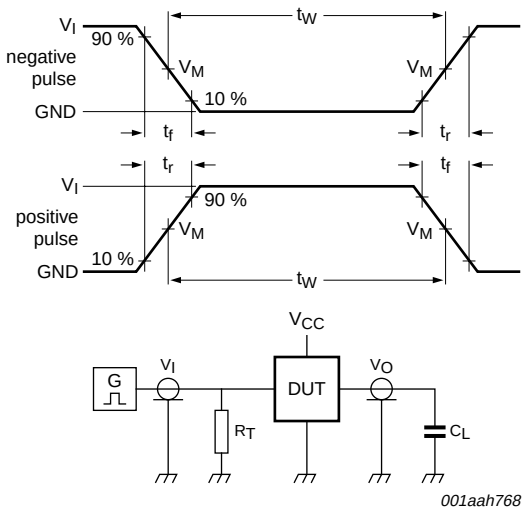
Measurement points are given in Table 8.

Fig 14. Shift register reset to storage register clock set-up time

Table 8. Measurement points

Type	Input	Output
	V_M	V_M
74AHC594	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
74AHCT594	1.5 V	$0.5 \times V_{CC}$

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For test data see Table 9.

Definitions for test circuit:

R_T = Termination resistance should be equal to output impedance Z_o of the pulse generator.

C_L = Load capacitance including jig and probe capacitance.

Fig 15. Load circuitry for measuring switching times

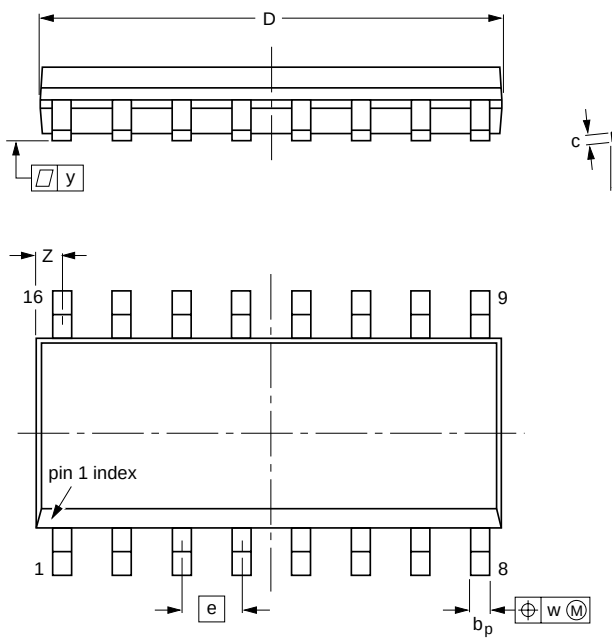
Table 9. Test data

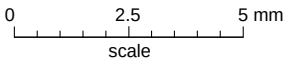
Type	Input		Load	Test
	V_I	t_r, t_f	C_L	
74AHC594	V_{CC}	≤ 3.0 ns	15 pF, 50 pF	t_{PLH}, t_{PHL}
74AHCT594	3.0 V	≤ 3.0 ns	15 pF, 50 pF	t_{PLH}, t_{PHL}

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13. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm **SOT109-1**





DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(1)}$	e	H_E	L	L_p	Q	v	w	y	$Z^{(1)}$	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8^o 0^o
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

Note

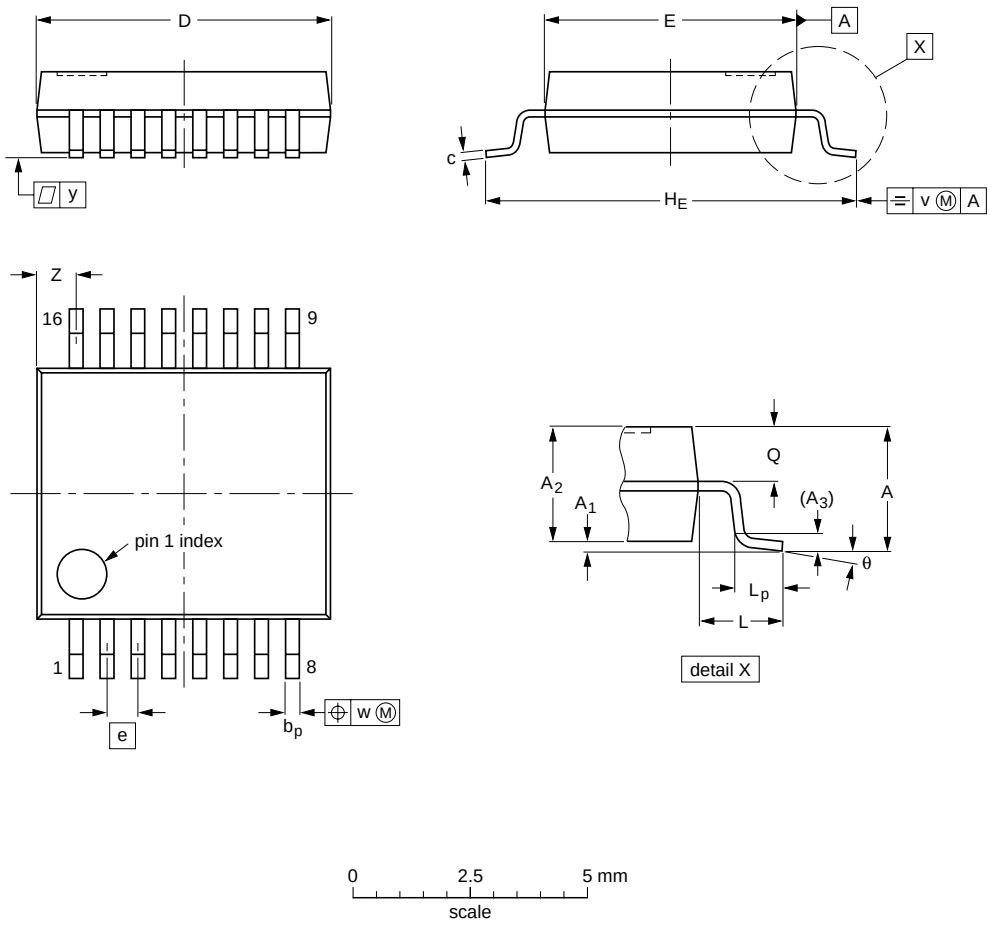
1. Plastic or metal protrusions of 0.15 mm (0.006 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT109-1	076E07	MS-012				~~99-12-27~~ 03-02-19

Fig 16. Package outline SOT109-1 (SO16)

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SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm **SOT338-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (1)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	6.4 6.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	1.00 0.55	8^o 0^o

Note

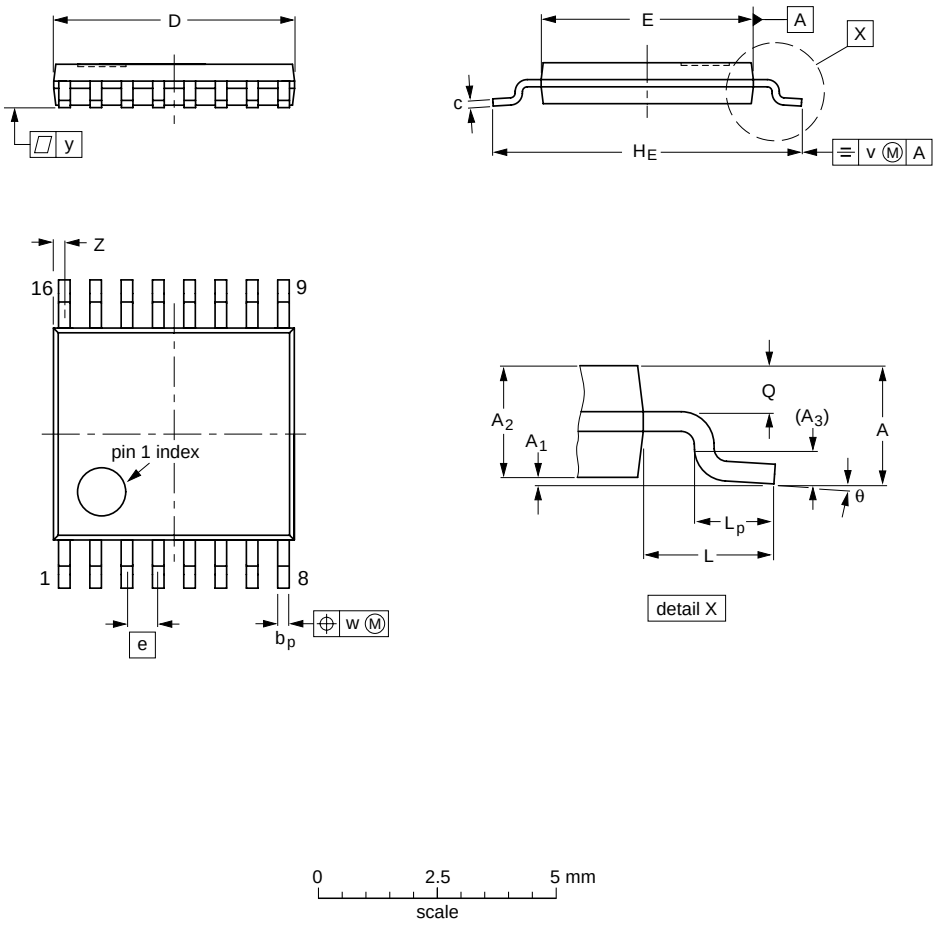
1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT338-1		MO-150				~~99-12-27~~ 03-02-19

Fig 17. Package outline SOT338-1 (SSOP16)

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TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm **SOT403-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D (1)	E (2)	e	H_E	L	L_p	Q	v	w	y	Z (1)	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	5.1 4.9	4.5 4.3	0.65	6.6 6.2	1	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.40 0.06	8^o 0^o

Notes

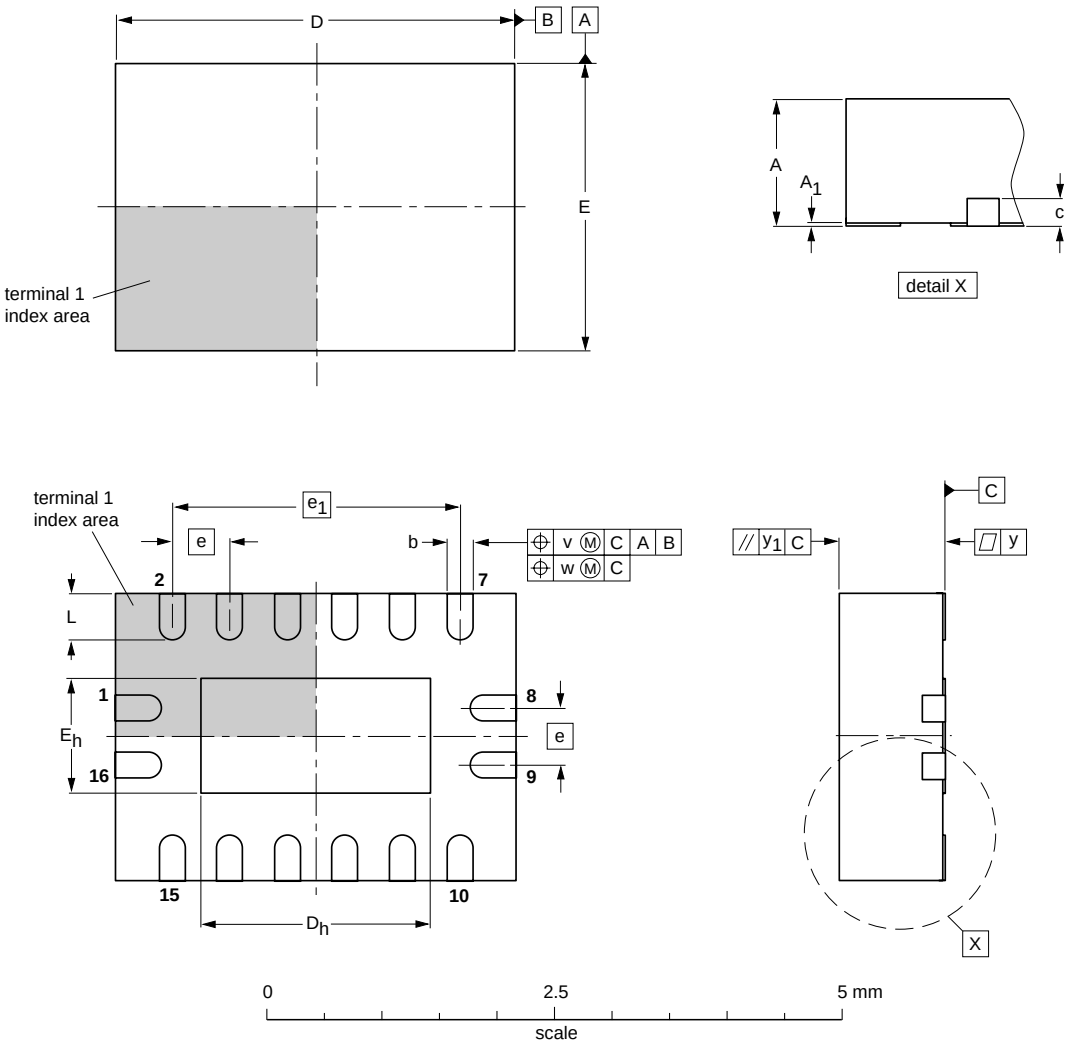
1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT403-1		MO-153				~~99-12-27~~ 03-02-18

Fig 18. Package outline SOT403-1 (TSSOP16)

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DHVQFN16: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 16 terminals; body 2.5 x 3.5 x 0.85 mm **SOT763-1**



DIMENSIONS (mm are the original dimensions)

UNIT	$A^{(1)}$ max.	A_1	b	c	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	L	v	w	y	y_1
mm	1	0.05 0.00	0.30 0.18	0.2	3.6 3.4	2.15 1.85	2.6 2.4	1.15 0.85	0.5	2.5	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT763-1	- - -	MO-241	- - -			~~02-10-17~~ 03-01-27

Fig 19. Package outline SOT763-1 (DHVQFN16)

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14. Abbreviations

Table 10. Abbreviations

Acronym	Description
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
LSTTL	Low-power Schottky Transistor-Transistor Logic
MM	Machine Model

15. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT594_2	20080609	Product data sheet	-	74AHC_AHCT594_1
Modifications:	• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors. • Legal texts have been adapted to the new company name where appropriate. • Table 6: the conditions for input leakage current have been changed.			
74AHC_AHCT594_1	20060704	Product data sheet	-	-

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Document status[1][2]	Product status[3]	Definition
Objective [short] data sheet	Development	This document contains data from the objective specification for product development.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

[1] Please consult the most recently issued document before initiating or completing a design.

[2] The term 'short data sheet' is explained in section "Definitions".

[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nxp.com.

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18. Contents

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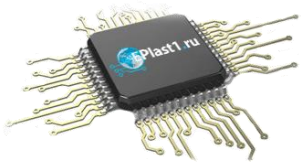
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