

# 74AHC594; 74AHCT594

## 8-bit shift register with output register

Rev. 3 — 25 June 2020

Product data sheet

### 1. General description

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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 ( $\overline{\text{SHR}}$  and  $\overline{\text{STR}}$ ) 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 and benefits

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- Wide supply voltage range from 2.0 V to 5.5 V
- Balanced propagation delays
- All inputs have Schmitt-trigger action
- Overvoltage tolerant inputs to 5.5 V
- High noise immunity
- CMOS low power dissipation
- 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 JESD 78 Class II Level A
- Input levels:
  - For 74AHC594: CMOS level
  - For 74AHCT594: TTL level
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - MM JESD22-A115-A exceeds 200 V
  - CDM JESD22-C101E exceeds 1000 V
- Multiple package options
- Specified from -40 °C to +85 °C and from -40 °C to +125 °C

### 3. Applications

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

### 4. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74AHC594D	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74AHCT594D				
74AHC594DB	-40 °C to +125 °C	SSOP16	plastic shrink small outline package; 16 leads; body width 5.3 mm	SOT338-1
74AHCT594DB				
74AHC594PW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74AHCT594PW				
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
74AHCT594BQ				

### 5. Functional diagram

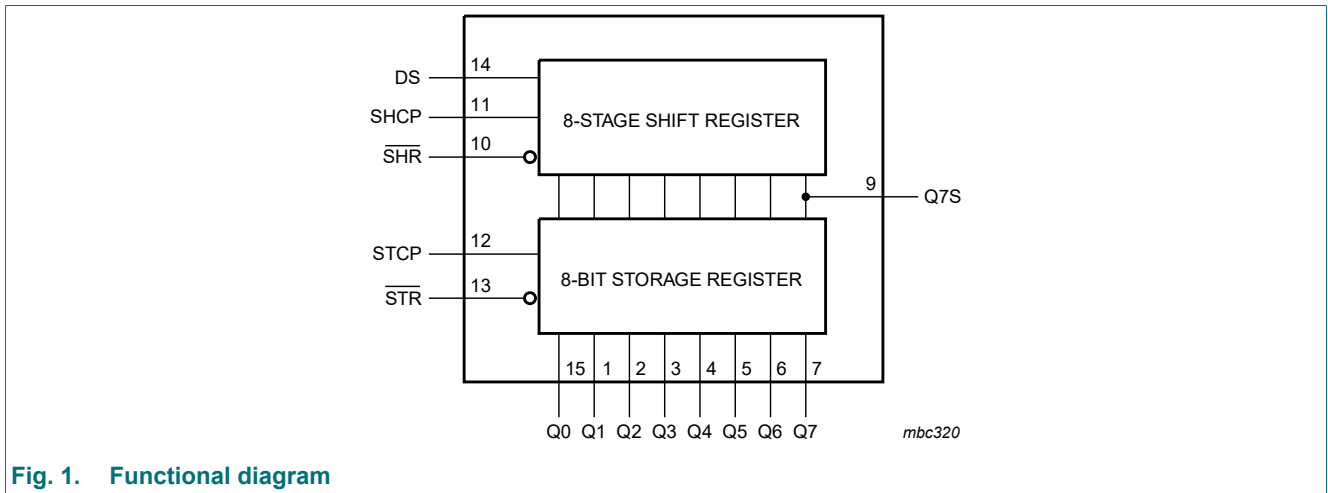


Fig. 1. Functional diagram

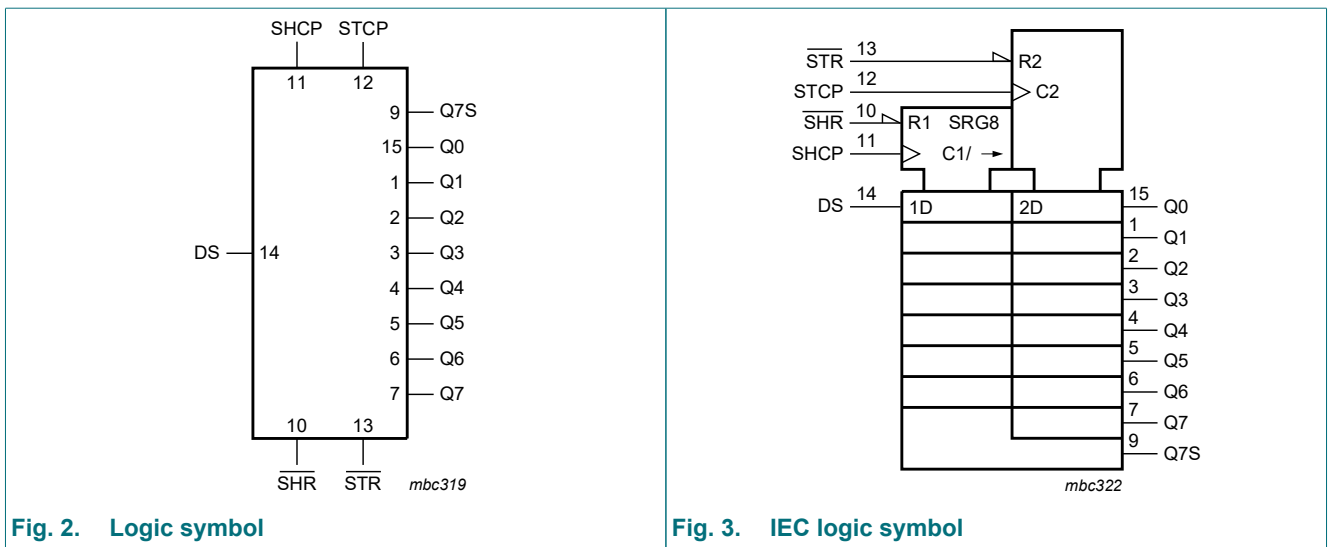


Fig. 2. Logic symbol

Fig. 3. IEC logic symbol

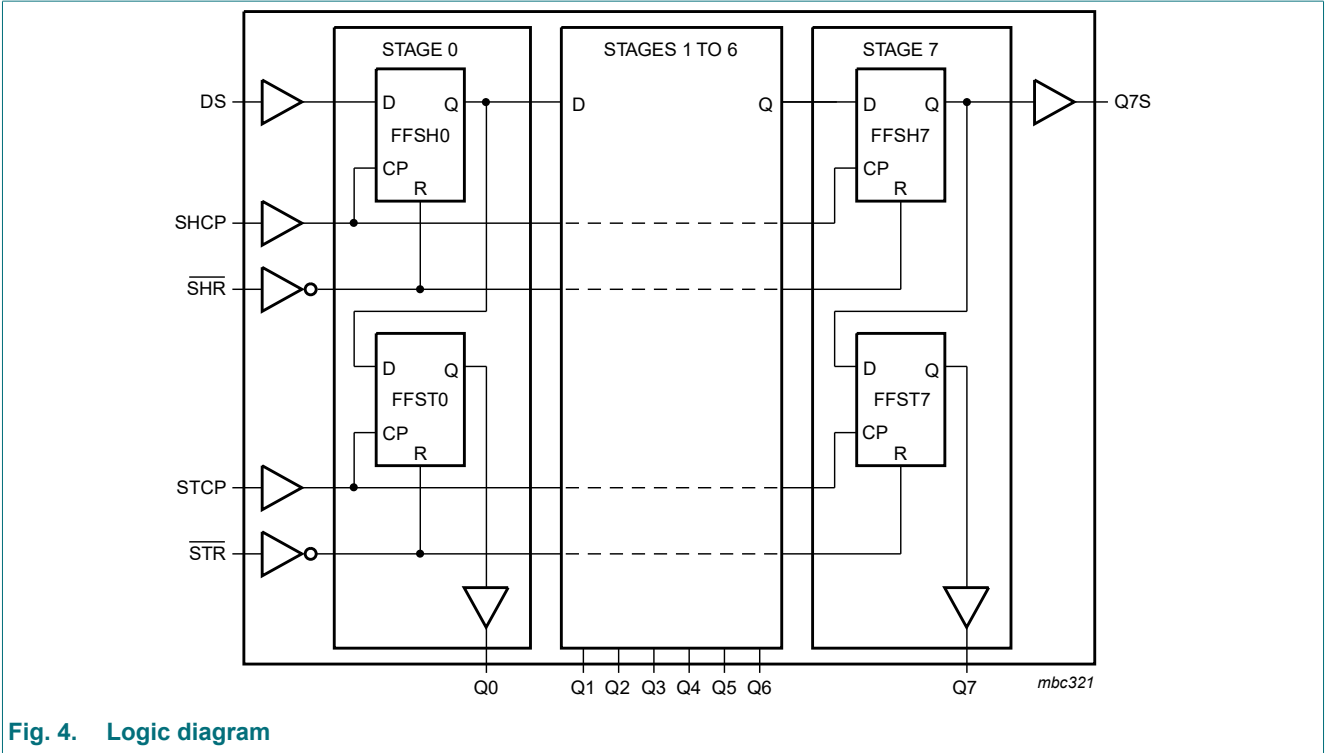


Fig. 4. Logic diagram

## 6. Pinning information

### 6.1. Pinning

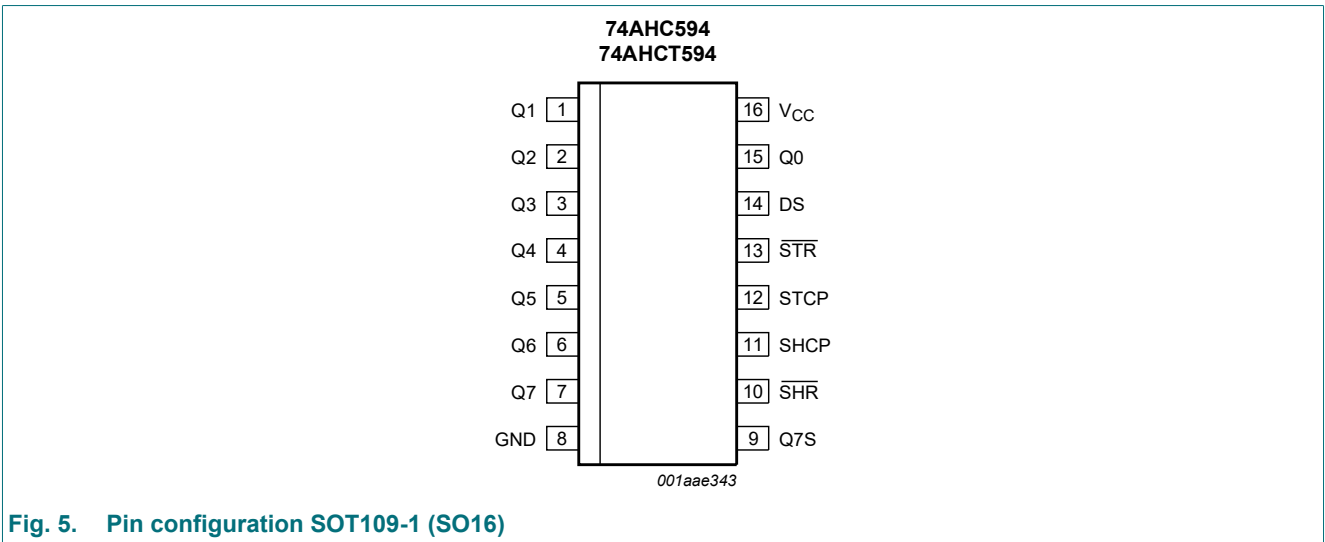


Fig. 5. Pin configuration SOT109-1 (SO16)

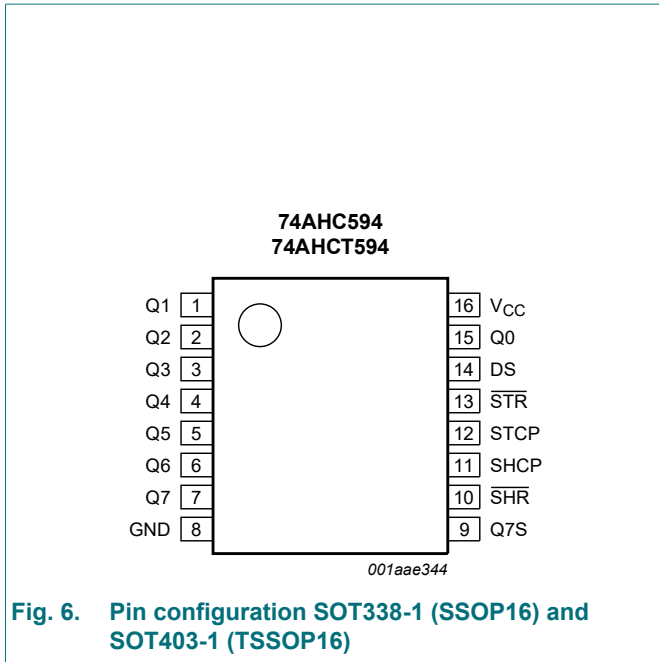


Fig. 6. Pin configuration SOT338-1 (SSOP16) and SOT403-1 (TSSOP16)

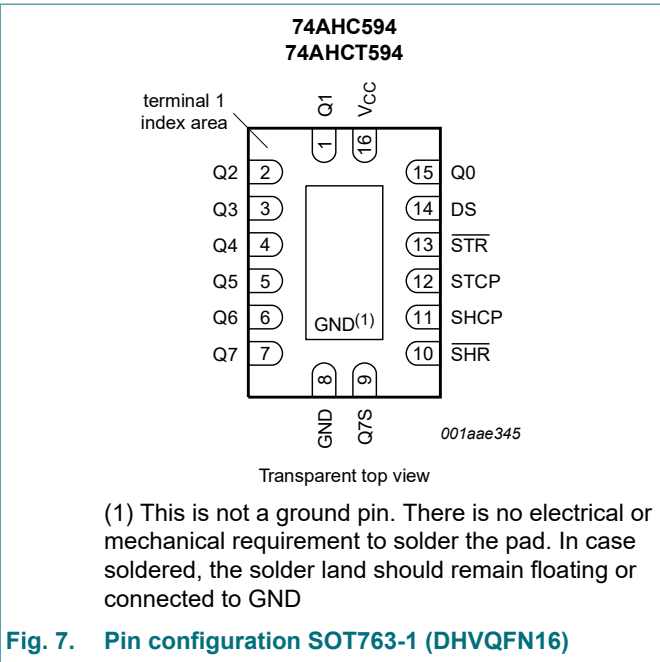


Fig. 7. Pin configuration SOT763-1 (DHVQFN16)

(1) This is not a ground pin. There is no electrical or mechanical requirement to solder the pad. In case soldered, the solder land should remain floating or connected to GND

## 6.2. Pin description

Table 2. Pin description

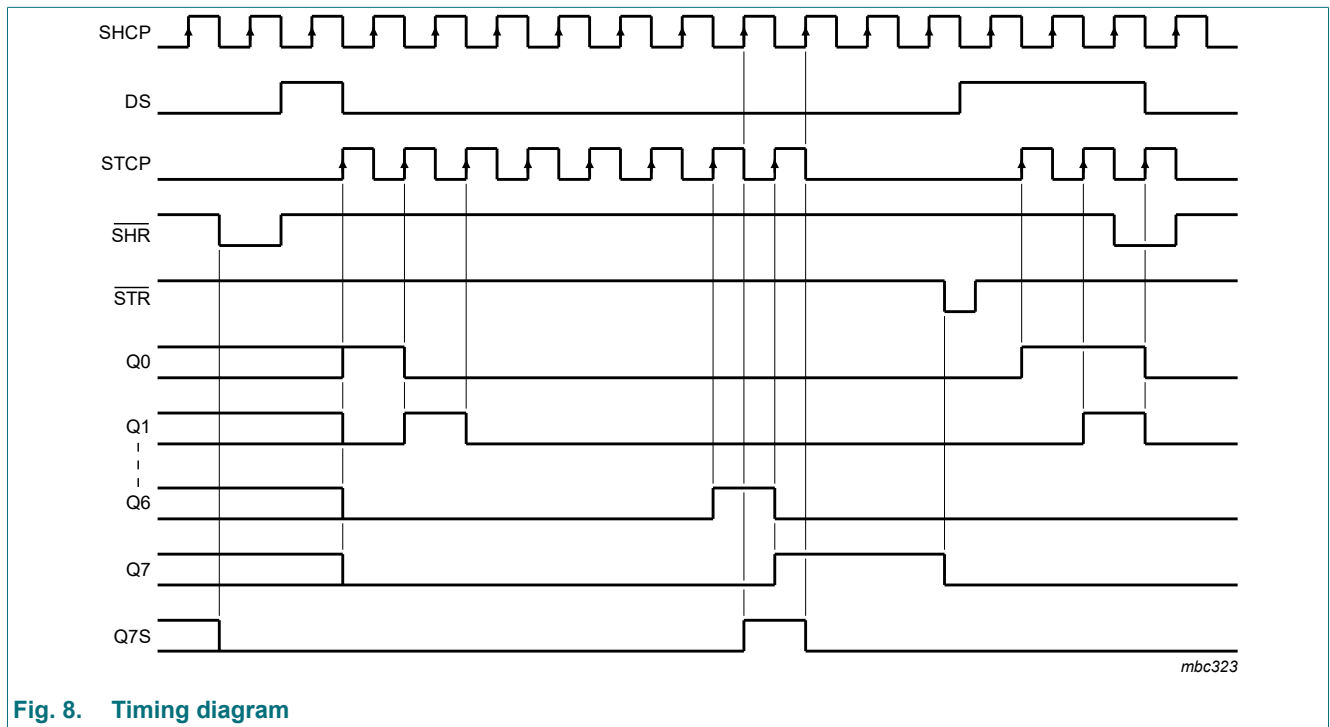
Symbol	Pin	Description
Q0, Q1, Q2, Q3, Q4, Q5, Q6, Q7	15, 1, 2, 3, 4, 5, 6, 7	parallel data output
GND	8	ground (0 V)
Q7S	9	serial data output
SHR	10	shift register reset input (active LOW)
SHCP	11	shift register clock input
STCP	12	storage register clock input
STR	13	storage register reset input (active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

## 7. Functional description

**Table 3. Function table**

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

Input					Output		Function
SHCP	STCP	SHR	STR	DS	Q7S	Qn	
X	X	L	X	X	L	NC	a LOW-state on $\overline{\text{SHR}}$ only affects the shift register
X	X	X	L	X	NC	L	a LOW-state on $\overline{\text{STR}}$ 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



**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 SOT109-1 (SO16) package:  $P_{tot}$  derates linearly with 12.4 mW/K above 110 °C.  
 For SOT338-1 (SSOP16) package:  $P_{tot}$  derates linearly with 8.5 mW/K above 91 °C.  
 For SOT403-1 (TSSOP16) package:  $P_{tot}$  derates linearly with 8.5 mW/K above 91 °C.  
 For SOT763-1 (DHVQFN16) package:  $P_{tot}$  derates linearly with 11.2 mW/K above 106 °C.

## 9. Recommended operating conditions

**Table 5. Operating conditions**

Symbol	Parameter	Conditions	74AHC594			74AHCT594			Unit
			Min	Typ	Max	Min	Typ	Max	
$V_{CC}$	supply voltage		2.0	5.0	5.5	4.5	5.0	5.5	V
$V_I$	input voltage		0	-	5.5	0	-	5.5	V
$V_O$	output voltage		0	-	$V_{CC}$	0	-	$V_{CC}$	V
$T_{amb}$	ambient temperature		-40	+25	+125	-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	-	-	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	
<b>74AHC594</b>										
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 2.0 V	1.5	-	-	1.5	-	1.5	-	V
		V <sub>CC</sub> = 3.0 V	2.1	-	-	2.1	-	2.1	-	V
		V <sub>CC</sub> = 5.5 V	3.85	-	-	3.85	-	3.85	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 2.0 V	-	-	0.5	-	0.5	-	0.5	V
		V <sub>CC</sub> = 3.0 V	-	-	0.9	-	0.9	-	0.9	V
		V <sub>CC</sub> = 5.5 V	-	-	1.65	-	1.65	-	1.65	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = -50 µA; V <sub>CC</sub> = 2.0 V	1.9	2.0	-	1.9	-	1.9	-	V
		I <sub>O</sub> = -50 µA; V <sub>CC</sub> = 3.0 V	2.9	3.0	-	2.9	-	2.9	-	V
		I <sub>O</sub> = -50 µA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 3.0 V	2.58	-	-	2.48	-	2.40	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = 50 µA; V <sub>CC</sub> = 2.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 50 µA; V <sub>CC</sub> = 3.0 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 50 µA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 3.0 V	-	-	0.36	-	0.44	-	0.55	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	µA
		V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	4.0	-	40	-	80	µA
C <sub>I</sub>	input capacitance	V <sub>I</sub> = V <sub>CC</sub> or GND	-	3	10	-	10	-	10	pF

Symbol	Parameter	Conditions	25 °C			-40 °C to +85 °C		-40 °C to +125 °C		Unit
			Min	Typ	Max	Min	Max	Min	Max	
<b>74AHCT594</b>										
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	0.8	-	0.8	-	0.8	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = -50 µA; V <sub>CC</sub> = 4.5 V	4.4	4.5	-	4.4	-	4.4	-	V
		I <sub>O</sub> = -8.0 mA; V <sub>CC</sub> = 4.5 V	3.94	-	-	3.80	-	3.70	-	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>								
		I <sub>O</sub> = 50 µA; V <sub>CC</sub> = 4.5 V	-	0	0.1	-	0.1	-	0.1	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 4.5 V	-	-	0.36	-	0.44	-	0.55	V
I <sub>I</sub>	input leakage current	V <sub>I</sub> = 5.5 V or GND; V <sub>CC</sub> = 0 V to 5.5 V	-	-	0.1	-	1.0	-	2.0	µA
I <sub>CC</sub>	supply current	V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 5.5 V	-	-	4.0	-	40	-	80	µA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>I</sub> = V <sub>CC</sub> - 2.1 V; other pins at V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 4.5 V to 5.5 V	-	-	1.35	-	1.5	-	1.5	mA
C <sub>I</sub>	input capacitance	V <sub>I</sub> = V <sub>CC</sub> 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 Fig. 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	
<b>74AHC594</b>										
t <sub>PLH</sub>	LOW to HIGH propagation delay	SHCP to Q7S; see Fig. 9								
		V <sub>CC</sub> = 3.0 V to 3.6 V								
		C <sub>L</sub> = 15 pF	-	5.2	8.5	2.2	9.7	2.2	10.6	ns
		C <sub>L</sub> = 50 pF	-	7.4	11.5	3.0	13.2	3.0	14.3	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	3.8	6.3	1.7	7.2	1.7	7.8	ns
		C <sub>L</sub> = 50 pF	-	4.8	8.0	2.4	9.1	2.4	10.0	ns
		STCP to Qn; see Fig. 10								
		V <sub>CC</sub> = 3.0 V to 3.6 V								
		C <sub>L</sub> = 15 pF	-	5.1	8.3	2.3	9.5	2.3	10.6	ns
		C <sub>L</sub> = 50 pF	-	7.3	11.9	3.3	13.6	3.3	14.7	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V								
C <sub>L</sub> = 15 pF	-	3.5	5.7	1.8	6.5	1.8	7.1	ns		
C <sub>L</sub> = 50 pF	-	4.8	7.8	2.6	9.0	2.6	9.8	ns		



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 <sub>PHL</sub>	HIGH to LOW propagation delay	SHCP to Q7S; see <a href="#">Fig. 9</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V								
		C <sub>L</sub> = 15 pF	-	5.5	8.9	2.3	10.2	2.3	11.0	ns
		C <sub>L</sub> = 50 pF	-	7.4	12.1	3.0	13.9	3.0	15.1	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	4.1	6.7	1.9	7.6	1.9	8.2	ns
		C <sub>L</sub> = 50 pF	-	5.4	8.8	2.5	10.1	2.5	11.0	ns
		STCP to Qn; see <a href="#">Fig. 10</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V								
		C <sub>L</sub> = 15 pF	-	5.5	9.1	2.4	10.4	2.4	11.3	ns
		C <sub>L</sub> = 50 pF	-	7.3	12.0	3.2	13.8	3.2	15.0	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	3.7	6.0	1.9	6.9	1.9	7.5	ns
		C <sub>L</sub> = 50 pF	-	5.2	8.5	2.6	9.7	2.6	10.5	ns
		SHR to Q7S; see <a href="#">Fig. 13</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V								
		C <sub>L</sub> = 15 pF	-	5.7	9.5	2.3	10.8	2.3	11.7	ns
		C <sub>L</sub> = 50 pF	-	7.5	12.2	3.6	14.0	3.6	15.2	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V								
		C <sub>L</sub> = 15 pF	-	4.1	6.7	2.0	7.6	2.0	8.2	ns
C <sub>L</sub> = 50 pF	-	5.4	8.8	2.8	10.1	2.8	11.0	ns		
STR to Qn; see <a href="#">Fig. 12</a>										
V <sub>CC</sub> = 3.0 V to 3.6 V										
C <sub>L</sub> = 15 pF	-	5.8	9.6	2.8	11.0	2.8	12.0	ns		
C <sub>L</sub> = 50 pF	-	7.7	12.5	3.8	14.4	3.8	15.6	ns		
V <sub>CC</sub> = 4.5 V to 5.5 V										
C <sub>L</sub> = 15 pF	-	4.1	7.2	2.2	8.2	2.2	8.9	ns		
C <sub>L</sub> = 50 pF	-	5.4	9.4	3.0	10.7	3.0	11.6	ns		
f <sub>max</sub>	maximum frequency	SHCP or STCP; see <a href="#">Fig. 9</a> and <a href="#">Fig. 10</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V	80	125	-	70	-	65	-	MHz
		V <sub>CC</sub> = 4.5 V to 5.5 V	90	170	-	80	-	70	-	MHz
t <sub>w</sub>	pulse width	SHCP and STCP HIGH or LOW; see <a href="#">Fig. 9</a> and <a href="#">Fig. 10</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V	6.0	-	-	6.5	-	7.0	-	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	5.5	-	-	6.0	-	6.5	-	ns
		SHR and STR HIGH or LOW; see <a href="#">Fig. 13</a> and <a href="#">Fig. 12</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V	5.0	-	-	5.0	-	5.5	-	ns
V <sub>CC</sub> = 4.5 V to 5.5 V	5.0	-	-	5.2	-	5.7	-	ns		

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 <sub>su</sub>	set-up time	DS to SHCP; see <a href="#">Fig. 11</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V	3.5	-	-	3.5	-	4.0	-	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	3.0	-	-	3.0	-	3.5	-	ns
		SHR to STCP; see <a href="#">Fig. 14</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V	8.0	-	-	9.0	-	9.5	-	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	5.0	-	-	5.0	-	5.5	-	ns
		SHCP to STCP; see <a href="#">Fig. 10</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V	8.0	-	-	8.5	-	9.0	-	ns
V <sub>CC</sub> = 4.5 V to 5.5 V	5.0	-	-	5.0	-	5.5	-	ns		
t <sub>h</sub>	hold time	DS to SHCP; see <a href="#">Fig. 11</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.5	-	-	1.5	-	2.0	-	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	2.0	-	-	2.0	-	2.5	-	ns
t <sub>rec</sub>	recovery time	SHR to SHCP; see <a href="#">Fig. 13</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V	4.2	-	-	4.8	-	5.3	-	ns
		V <sub>CC</sub> = 4.5 V to 5.5 V	2.9	-	-	3.3	-	3.8	-	ns
		STR to STCP; see <a href="#">Fig. 12</a>								
		V <sub>CC</sub> = 3.0 V to 3.6 V	4.6	-	-	5.3	-	5.8	-	ns
V <sub>CC</sub> = 4.5 V to 5.5 V	3.2	-	-	3.7	-	4.3	-	ns		
C <sub>PD</sub>	power dissipation capacitance	f <sub>i</sub> = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [2]	-	55	-	-	-	-	-	pF
<b>74AHCT594; V<sub>CC</sub> = 4.5 V to 5.5 V</b>										
t <sub>PLH</sub>	LOW to HIGH propagation delay	SHCP to Q7S; see <a href="#">Fig. 9</a>								
		C <sub>L</sub> = 15 pF	-	3.8	6.3	1.7	7.2	1.7	7.8	ns
		C <sub>L</sub> = 50 pF	-	4.8	8.0	2.2	9.1	2.2	9.9	ns
		STCP to Qn; see <a href="#">Fig. 10</a>								
		C <sub>L</sub> = 15 pF	-	3.5	5.7	1.8	6.5	1.8	7.1	ns
C <sub>L</sub> = 50 pF	-	4.6	7.7	2.6	8.8	2.6	9.6	ns		
t <sub>PHL</sub>	HIGH to LOW propagation delay	SHCP to Q7S; see <a href="#">Fig. 9</a>								
		C <sub>L</sub> = 15 pF	-	4.1	6.7	1.8	7.6	1.8	8.3	ns
		C <sub>L</sub> = 50 pF	-	5.4	8.8	2.4	10.1	2.4	11.0	ns
		STCP to Qn; see <a href="#">Fig. 10</a>								
		C <sub>L</sub> = 15 pF	-	3.7	6.1	1.9	6.9	1.9	7.2	ns
		C <sub>L</sub> = 50 pF	-	5.2	8.5	2.6	9.7	2.6	10.5	ns
		SHR to Q7S; see <a href="#">Fig. 13</a>								
		C <sub>L</sub> = 15 pF	-	4.3	7.0	2.4	8.0	2.4	8.7	ns
		C <sub>L</sub> = 50 pF	-	5.4	8.8	2.7	10.1	2.7	11.0	ns
STR to Qn; see <a href="#">Fig. 12</a>										
C <sub>L</sub> = 15 pF	-	4.5	7.4	2.3	8.4	2.3	9.2	ns		
C <sub>L</sub> = 50 pF	-	5.7	9.4	3.1	10.7	3.1	11.7	ns		
f <sub>max</sub>	maximum frequency	SHCP or STCP; see <a href="#">Fig. 9</a> and <a href="#">Fig. 10</a>	90	160	-	80	-	70	-	MHz

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 <sub>W</sub>	pulse width	SHCP and STCP HIGH or LOW; see Fig. 9 and Fig. 10	5.5	-	-	6.0	-	6.5	-	ns
		SHR and STR HIGH or LOW; see Fig. 13 and Fig. 12	5.2	-	-	5.5	-	6.0	-	ns
t <sub>su</sub>	set-up time	DS to SHCP; see Fig. 11	3.0	-	-	3.0	-	3.5	-	ns
		SHR to STCP; see Fig. 14	5.0	-	-	5.0	-	5.5	-	ns
		SHCP to STCP; see Fig. 10	5.0	-	-	5.0	-	5.5	-	ns
t <sub>h</sub>	hold time	DS to SHCP; see Fig. 11	2.0	-	-	2.0	-	2.5	-	ns
t <sub>rec</sub>	recovery time	SHR to SHCP; see Fig. 13	2.9	-	-	3.3	-	3.8	-	ns
		STR to STCP; see Fig. 12	3.4	-	-	3.8	-	4.3	-	ns
C <sub>PD</sub>	power dissipation capacitance	f <sub>i</sub> = 1 MHz; V <sub>I</sub> = GND to V <sub>CC</sub> [2]	-	55	-	-	-	-	-	pF

[1] Typical values are measured at nominal supply voltage (V<sub>CC</sub> = 3.3 V and V<sub>CC</sub> = 5.0 V).

[2] C<sub>PD</sub> is used to determine the dynamic power dissipation (P<sub>D</sub> in μW).

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum(C_L \times V_{CC}^2 \times f_o)$$

where:

f<sub>i</sub> = input frequency in MHz;

f<sub>o</sub> = output frequency in MHz;

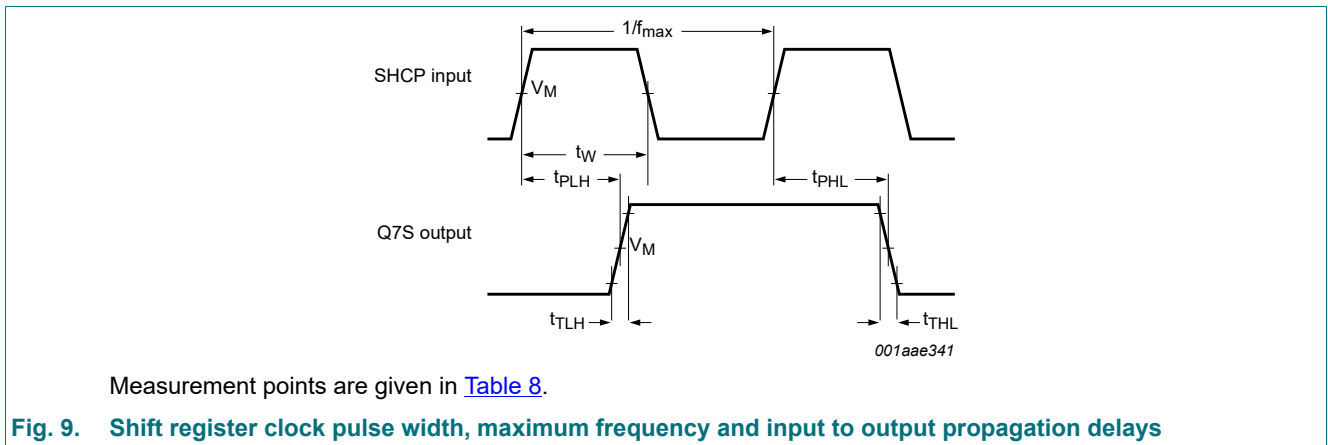
C<sub>L</sub> = output load capacitance in pF;

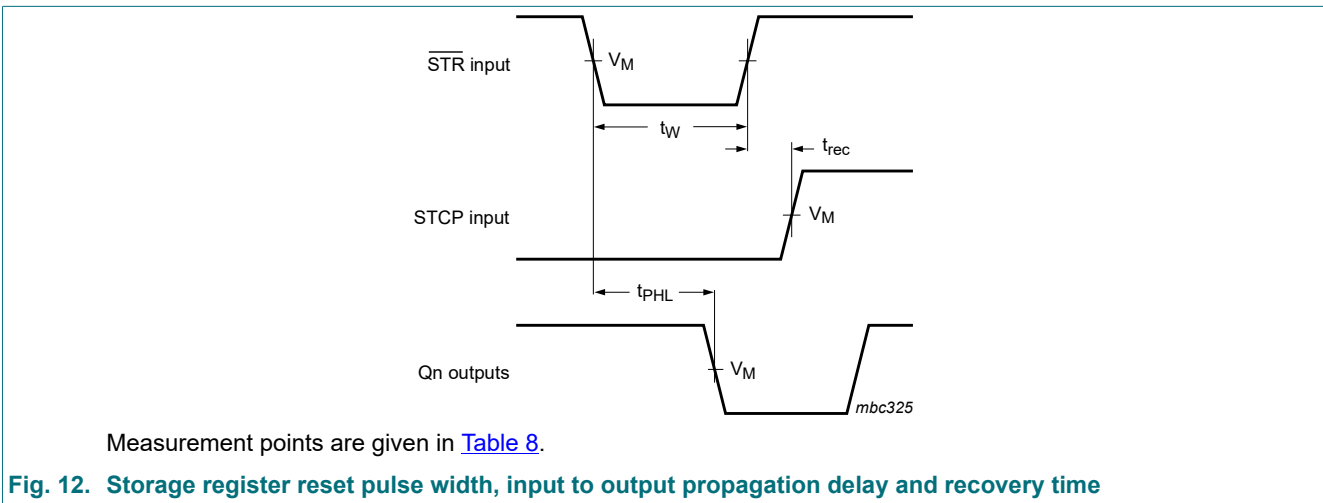
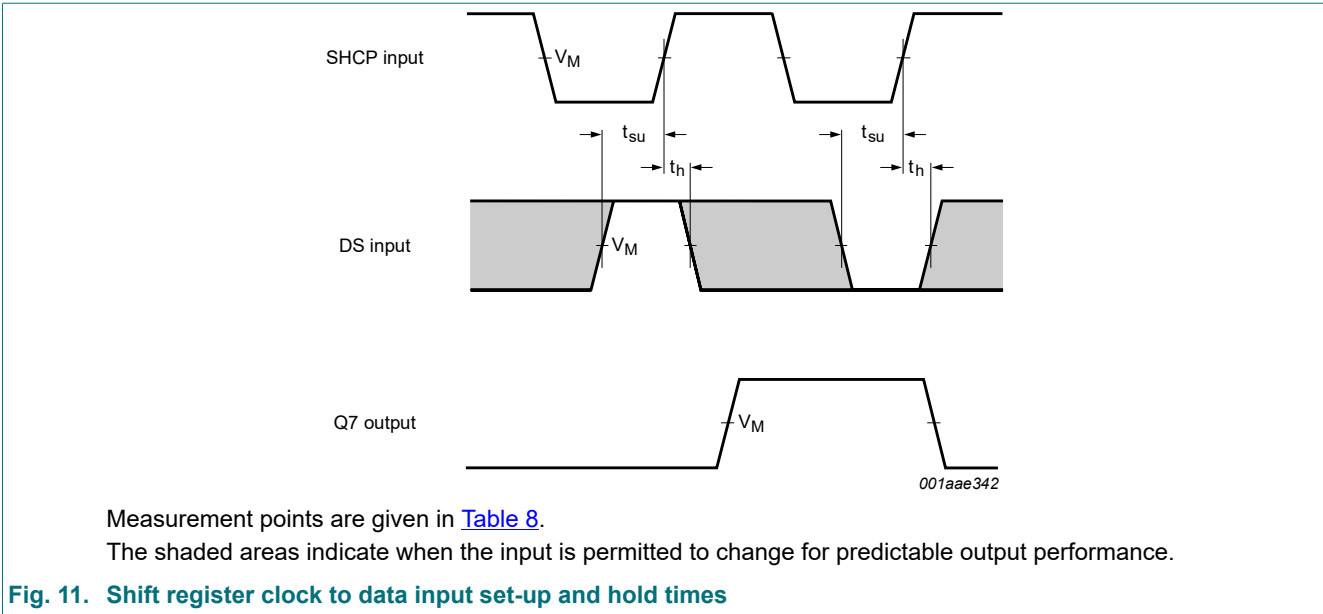
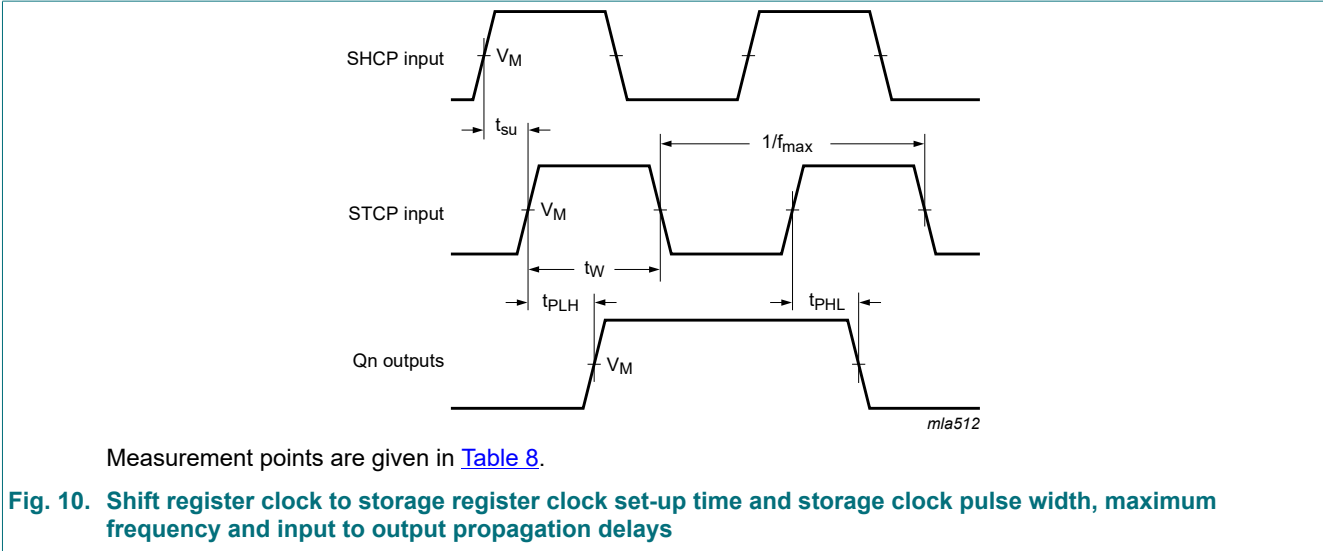
V<sub>CC</sub> = supply voltage in V;

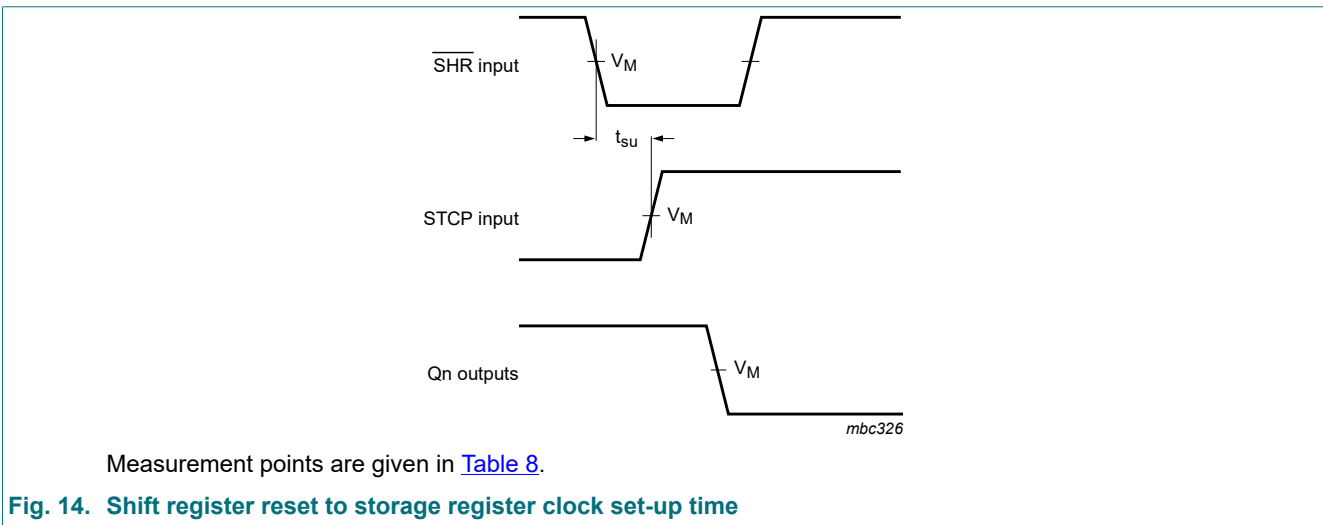
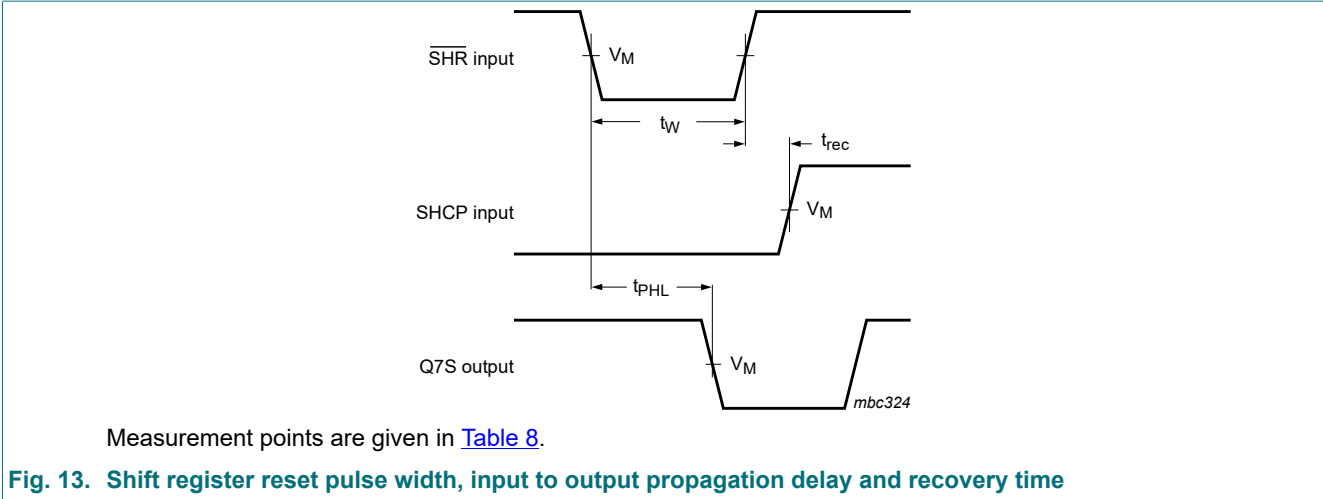
N = number of inputs switching;

∑(C<sub>L</sub> × V<sub>CC</sub><sup>2</sup> × f<sub>o</sub>) = sum of the outputs.

### 11.1. Waveforms

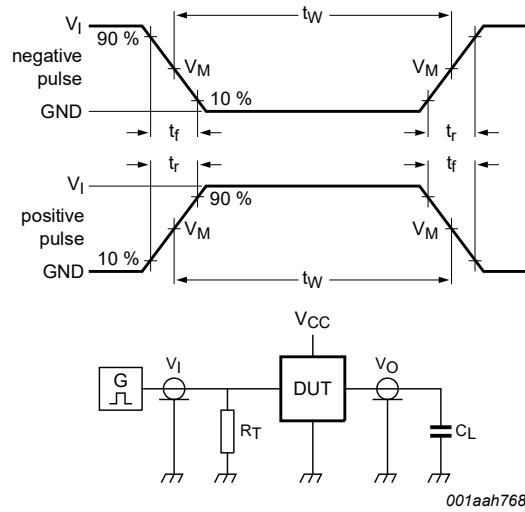






**Table 8. Measurement points**

Type	Input	Output
	V <sub>M</sub>	V <sub>M</sub>
74AHC594	0.5 x V <sub>CC</sub>	0.5 x V <sub>CC</sub>
74AHCT594	1.5 V	0.5 x V <sub>CC</sub>



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. Test circuit for measuring switching times**

**Table 9. Test data**

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

12. Package outline

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1

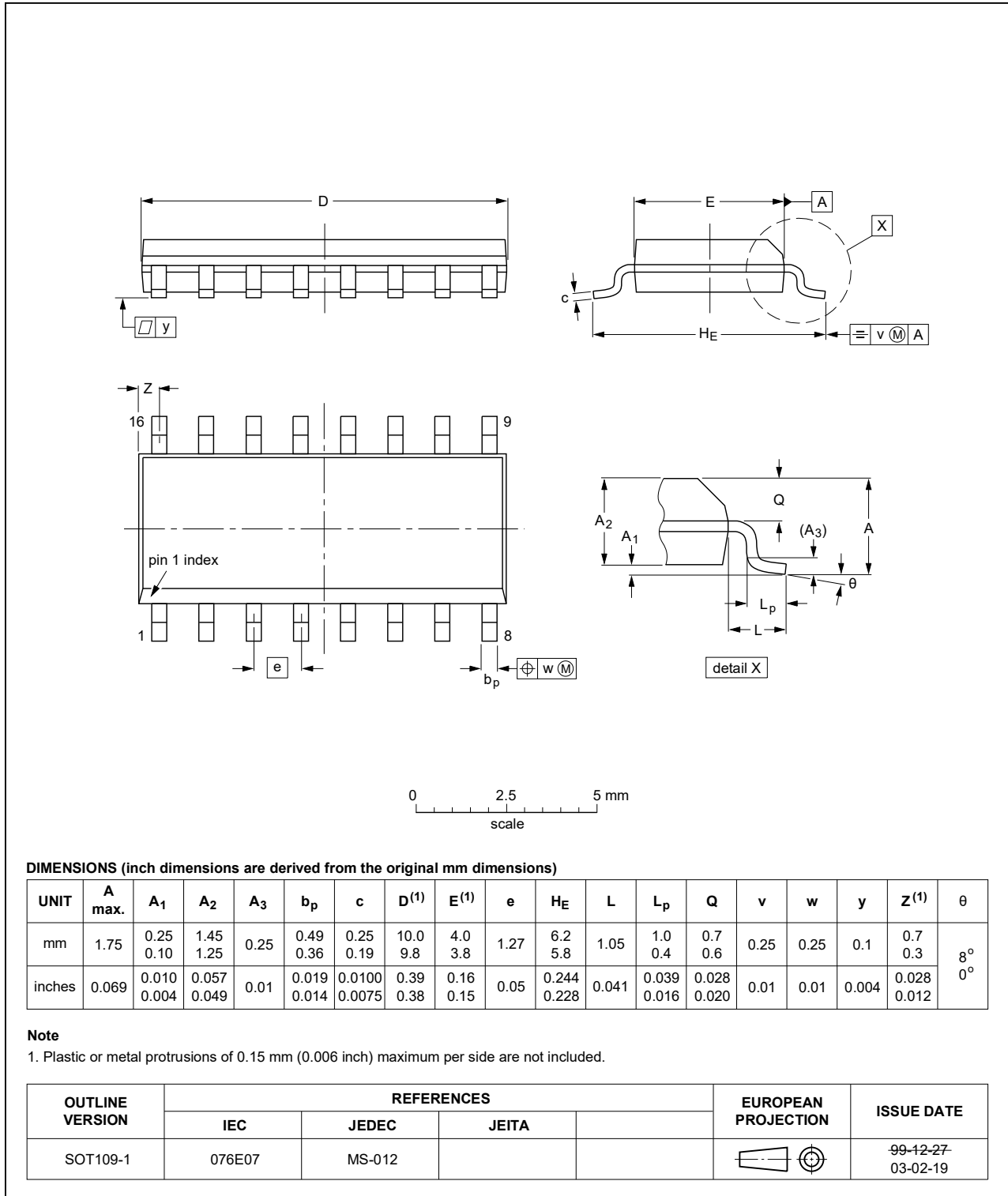


Fig. 16. Package outline SOT109-1 (SO16)

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1

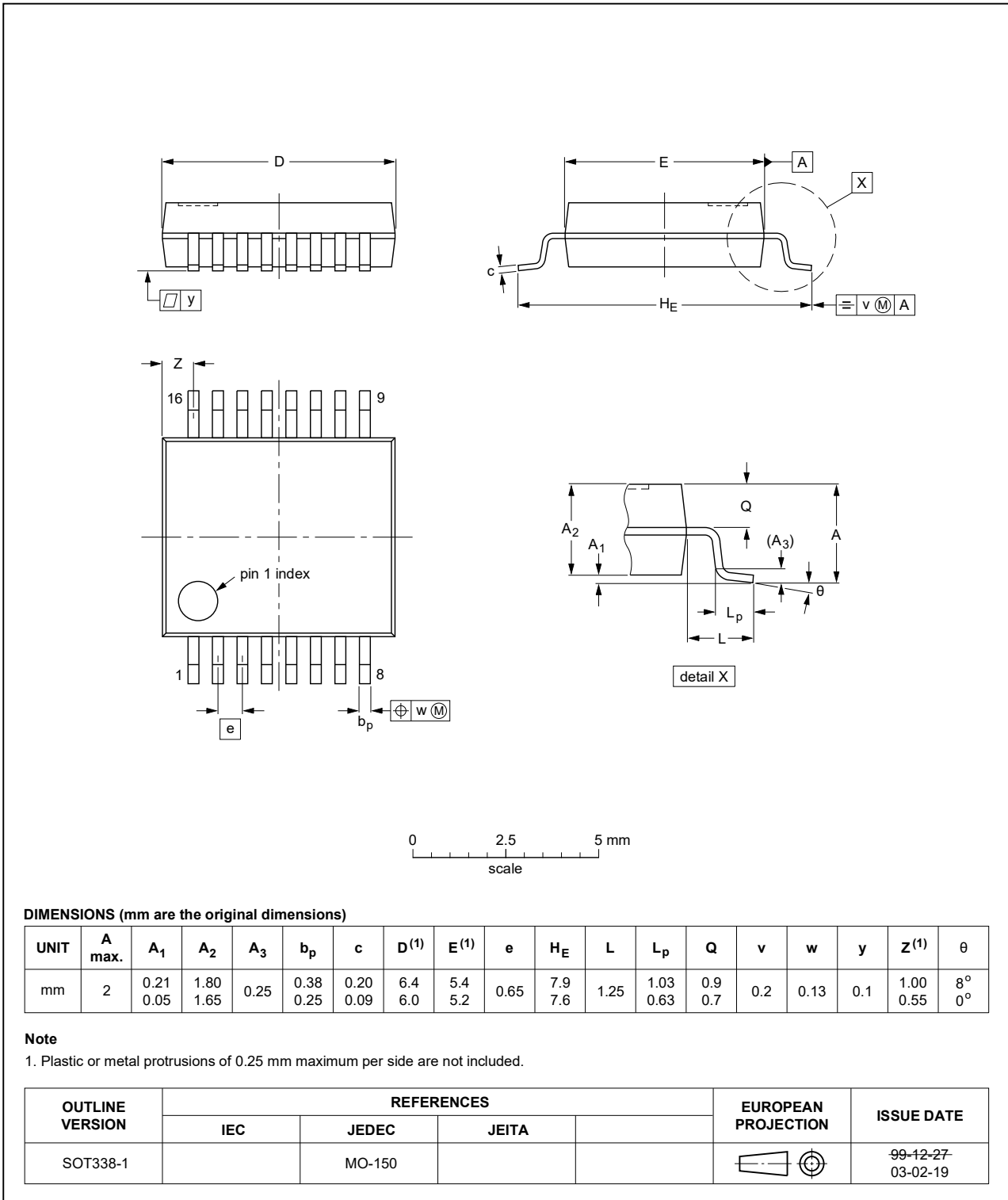


Fig. 17. Package outline SOT338-1 (SSOP16)



TSSOP16: plastic thin shrink small outline package; 16 leads; body width 4.4 mm

SOT403-1

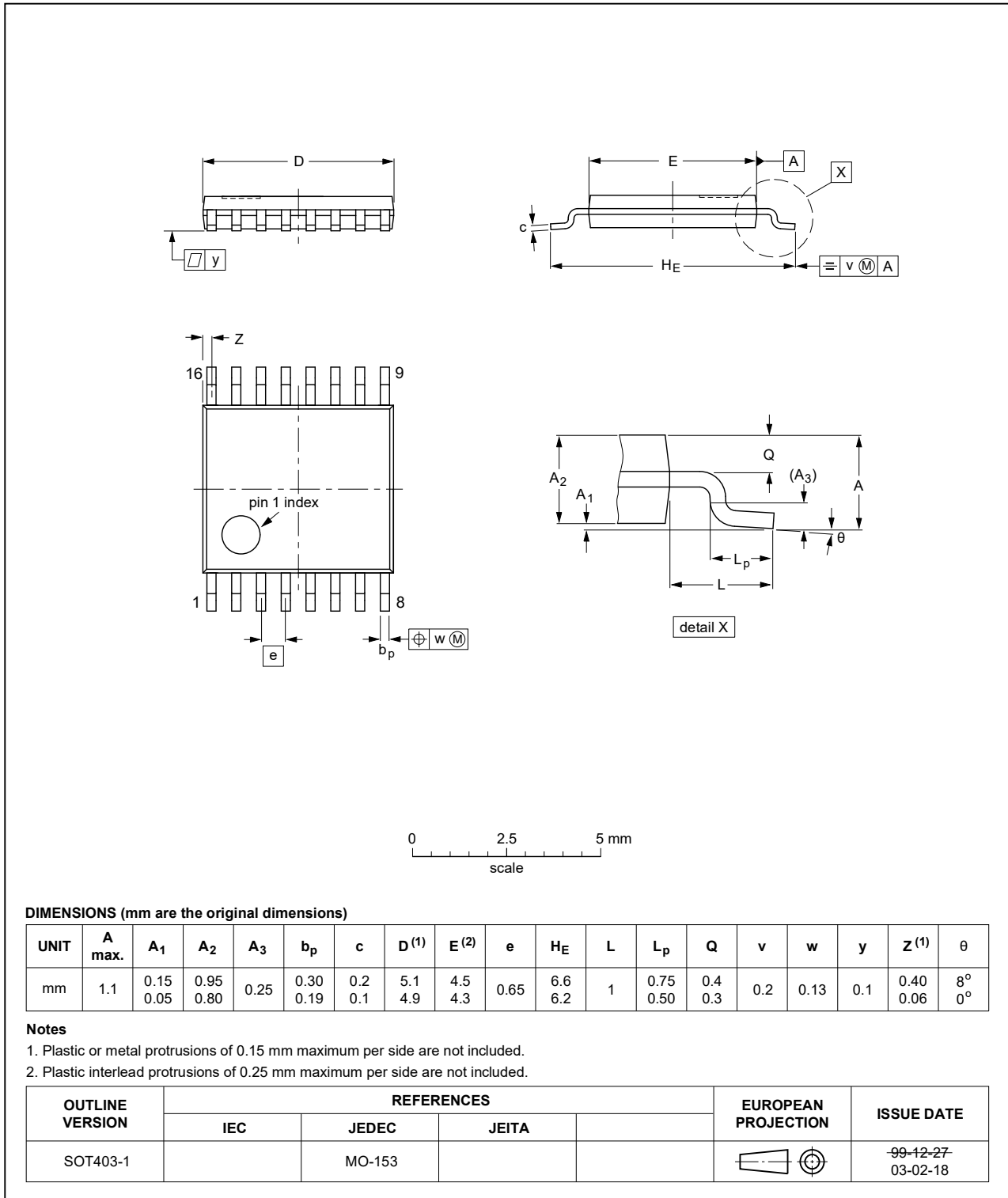


Fig. 18. Package outline SOT403-1 (TSSOP16)

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

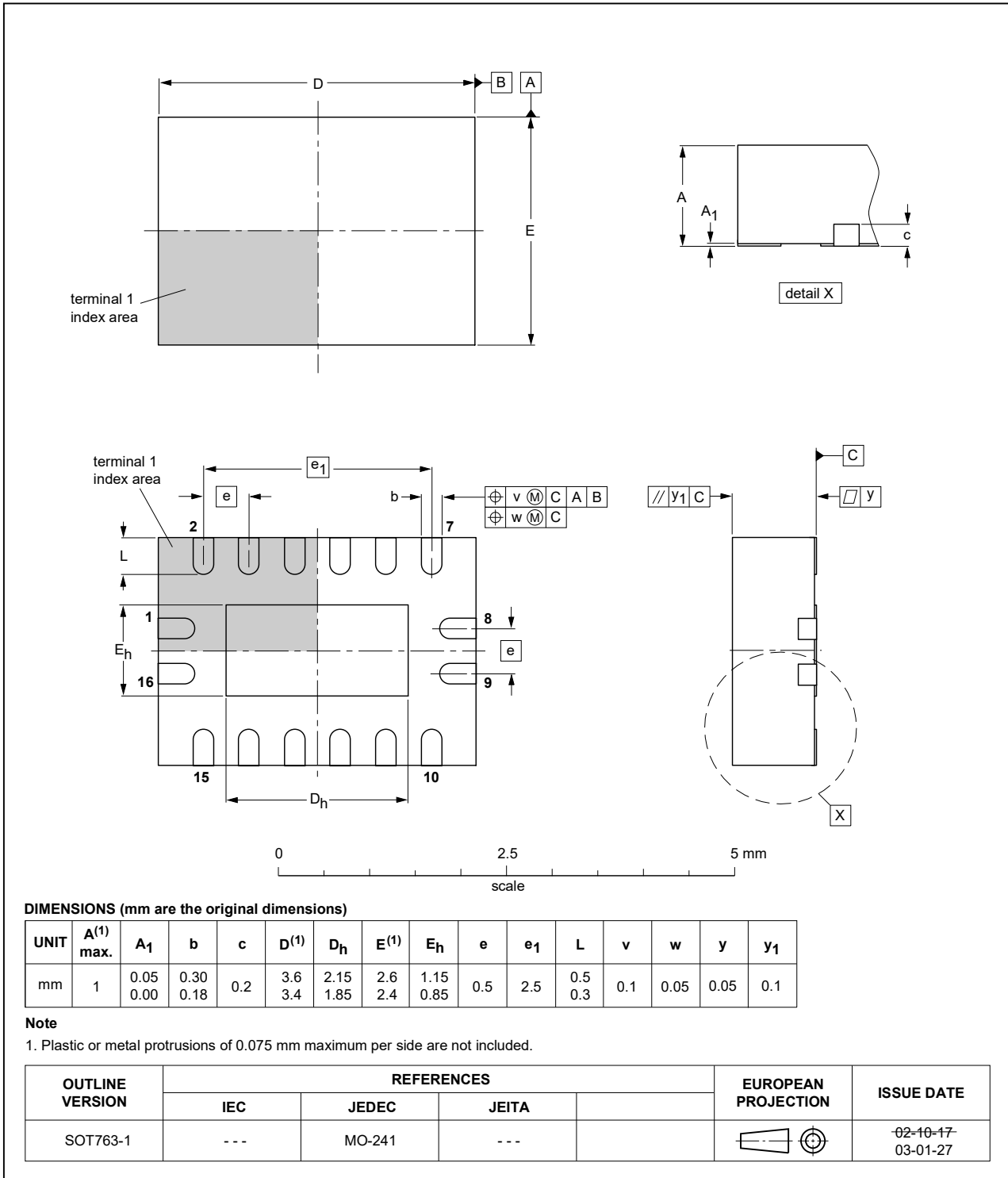


Fig. 19. Package outline SOT763-1 (DHVQFN16)

## 13. 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
TTL	Transistor-Transistor Logic

## 14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74AHC_AHCT594 v.3	20200625	Product data sheet	-	74AHC_AHCT594 v.2
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Section 2</a> updated.</li> <li><a href="#">Table 4</a>: Derating values for <math>P_{tot}</math> total power dissipation updated.</li> </ul>			
74AHC_AHCT594 v.2	20080609	Product data sheet	-	74AHC_AHCT594 v.1
Modifications:	<ul style="list-style-type: none"> <li>The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li> <li>Legal texts have been adapted to the new company name where appropriate.</li> <li><a href="#">Table 6</a>: the conditions for input leakage current have been changed.</li> </ul>			
74AHC_AHCT594 v.1	20060704	Product data sheet	-	-

## 15. Legal information

### Data sheet status

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".
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