

# 74LVC594A

## 8-bit shift register with output register

Rev. 3 — 20 July 2017

Product data sheet

## 1 General description

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The 74LVC594A is an 8-bit serial-in/serial or parallel-out shift register with a storage register. Separate clock and reset inputs are provided on both shift and storage registers.

The input can be driven from either 3.3 V or 5 V devices. This feature allows the use of this device in a mixed 3.3 V and 5 V environment.

This device is fully specified for partial Power-down applications using  $I_{OFF}$ . The  $I_{OFF}$  circuitry disables the output, preventing the damaging backflow current through the device when it is powered down.

The shift register has a serial input (DS) and a serial output (Q7S) for cascading purposes. Data is shifted on the positive-going transitions of the SHCP input. The data in the shift register is transferred to the storage register on a positive-going transition of the STCP input. If both clocks are connected together, the shift register will always be one clock pulse ahead of the storage register. A LOW level on one of the two register reset pins ( $\overline{SHR}$  and  $\overline{STR}$ ) will clear the corresponding register.

## 2 Features and benefits

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- 5 V tolerant inputs/outputs for interfacing with 5 V logic
- Wide supply voltage range from 1.2 V to 3.6 V
- CMOS low-power consumption
- Direct interface with TTL levels
- Balanced propagation delays
- All inputs have Schmitt-trigger action
- Complies with JEDEC standard:
  - JESD8-7A (1.65 V to 1.95 V)
  - JESD8-5A (2.3 V to 2.7 V)
  - JESD8-C/JESD36 (2.7 V to 3.6 V)
- ESD protection:
  - HBM JESD22-A114F exceeds 2000 V
  - CDM JESD22-C101E exceeds 1000 V
- Specified from -40 °C to +85 °C and -40 °C to +125 °C

## 3 Applications

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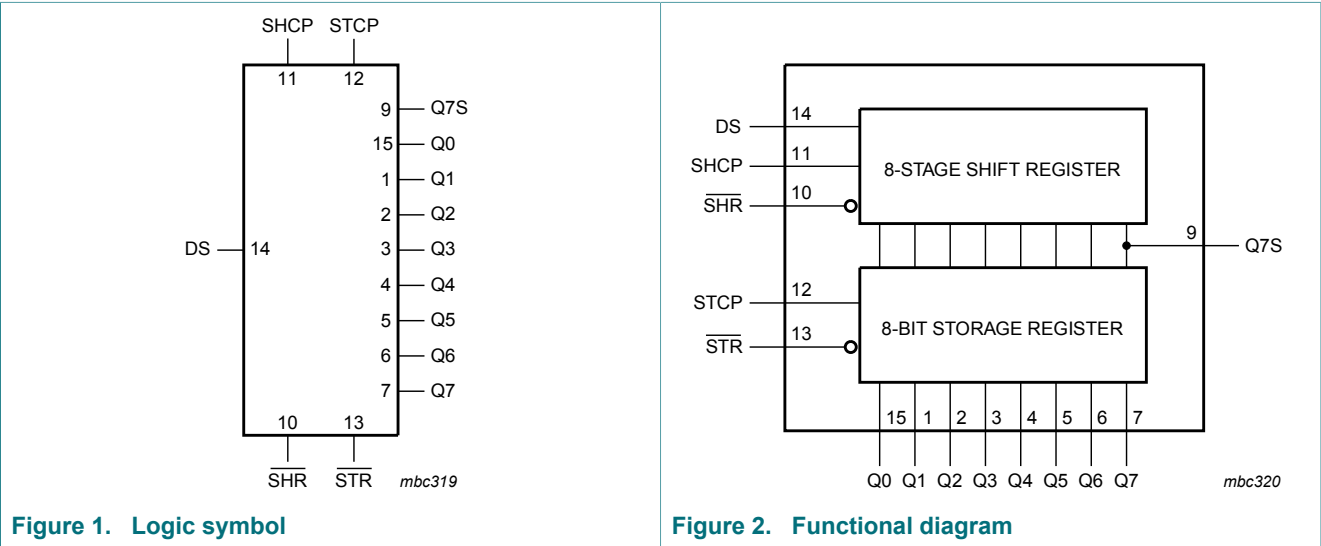
- Serial-to-parallel data conversion
- Remote control holding register

4 Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
74LVC594AD	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74LVC594APW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74LVC594ABQ	-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 x 3.5 x 0.85 mm	SOT763-1

5 Functional diagram



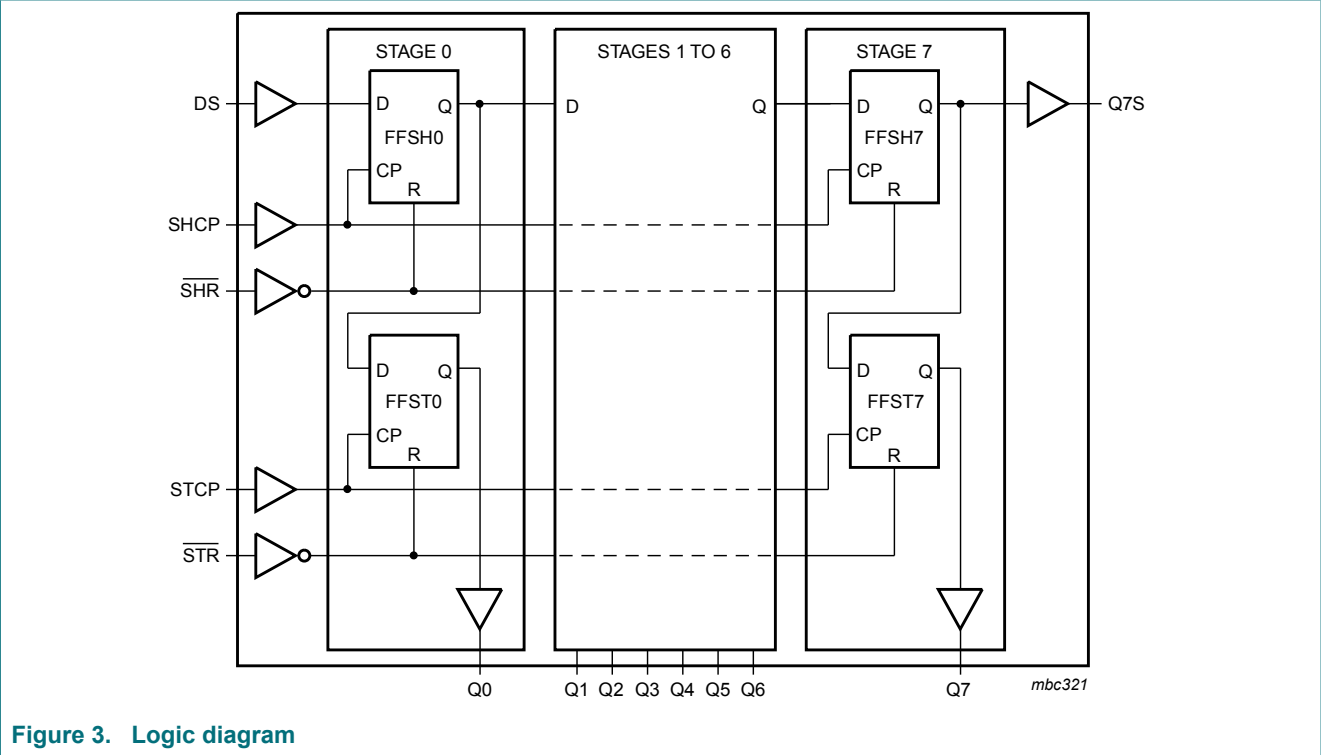


Figure 3. Logic diagram

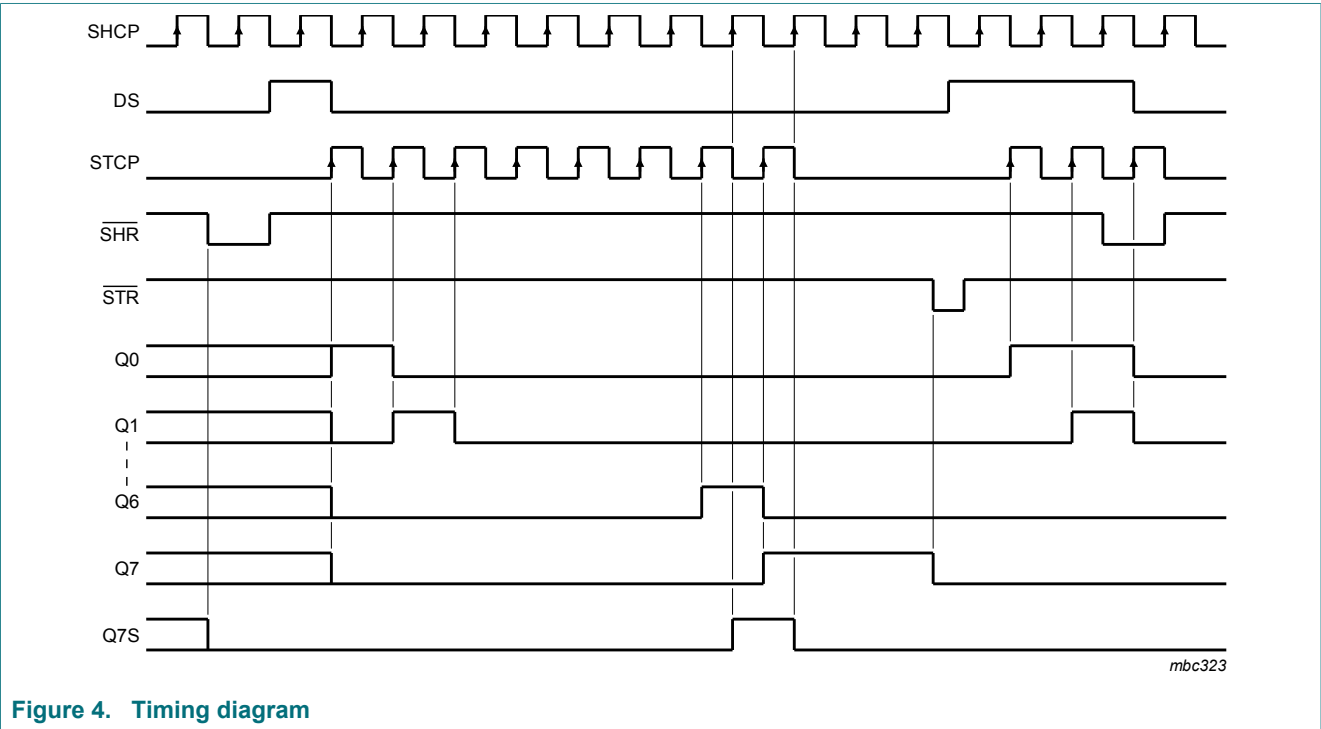


Figure 4. Timing diagram

6 Pinning information

6.1 Pinning

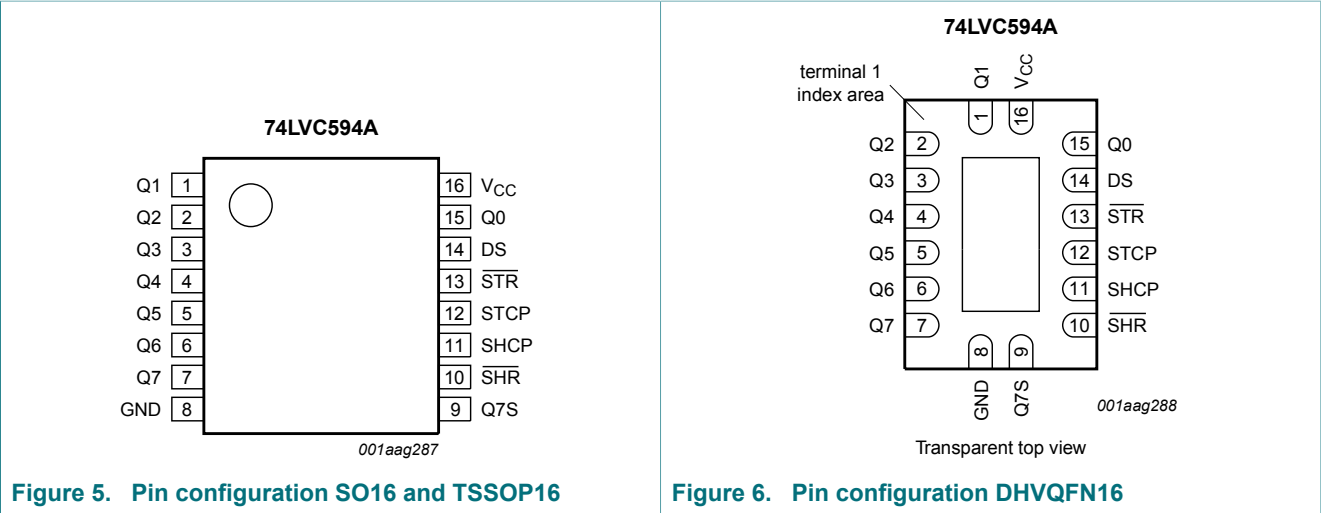


Figure 5. Pin configuration SO16 and TSSOP16

Figure 6. Pin configuration DHVQFN16

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 (active LOW)
SHCP	11	shift register clock input
STCP	12	storage register clock input
STR	13	storage register reset (active LOW)
DS	14	serial data input
VCC	16	supply voltage

## 7 Functional description

Table 3. Function table <sup>[1]</sup>

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

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

## 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	+6.5	V
$I_{IK}$	input clamping current	$V_I < 0$ V	-50	-	mA
$V_I$	input voltage	<sup>[1]</sup>	-0.5	+6.5	V
$I_{OK}$	output clamping current	$V_O > V_{CC}$ or $V_O < 0$ V	-	±50	mA
$V_O$	output voltage	3-state <sup>[1]</sup>	-0.5	6.5	V
		output HIGH or LOW state <sup>[1]</sup>	-0.5	$V_{CC} + 0.5$	V
$I_O$	output current	$V_O = 0$ V to $V_{CC}$	-	±50	mA
$I_{CC}$	supply current		-	100	mA
$I_{GND}$	ground current		-100	-	mA
$T_{stg}$	storage temperature		-65	+150	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40$ °C to +125 °C <sup>[2]</sup>	-	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 with 8 mW/K.  
 For TSSOP16 packages: above 60 °C the value of  $P_{tot}$  derates linearly with 5.5 mW/K.  
 For DHVQFN16 packages: above 60 °C the value of  $P_{tot}$  derates linearly with 4.5 mW/K.

## 9 Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	supply voltage		1.65	-	3.6	V
		functional	1.2	-	-	V
V <sub>I</sub>	input voltage		0	-	5.5	V
V <sub>O</sub>	output voltage	3-state	0	-	5.5	V
		output HIGH or LOW state	0	-	V <sub>CC</sub>	V
T <sub>amb</sub>	ambient temperature		-40	-	+125	°C
Δt/ΔV	input transition rise and fall rate	V <sub>CC</sub> = 1.65 V to 2.7 V	-	-	20	ns/V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	10	ns/V

## 10 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 <sup>[1]</sup>	Max	Min	Max	
V <sub>IH</sub>	HIGH-level input voltage	V <sub>CC</sub> = 1.2 V	1.08	-	-	1.08	-	V
		V <sub>CC</sub> = 1.65 V to 1.95 V	0.65V <sub>CC</sub>	-	-	0.65V <sub>CC</sub>	-	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.7	-	-	1.7	-	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	2.0	-	-	2.0	-	V
V <sub>IL</sub>	LOW-level input voltage	V <sub>CC</sub> = 1.2 V	-	-	0.12	-	0.12	V
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	-	0.35V <sub>CC</sub>	-	0.35V <sub>CC</sub>	V
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	-	0.7	-	0.7	V
		V <sub>CC</sub> = 2.7 V to 3.6 V	-	-	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> = -100 μA; V <sub>CC</sub> = 1.65 V to 3.6 V	V <sub>CC</sub> -0.2	-	-	V <sub>CC</sub> -0.3	-	V
		I <sub>O</sub> = -4 mA; V <sub>CC</sub> = 1.65 V	1.2	-	-	1.05	-	V
		I <sub>O</sub> = -8 mA; V <sub>CC</sub> = 2.3 V	1.8	-	-	1.65	-	V
		I <sub>O</sub> = -12 mA; V <sub>CC</sub> = 2.7 V	2.2	-	-	2.05	-	V
		I <sub>O</sub> = -18 mA; V <sub>CC</sub> = 3.0 V	2.4	-	-	2.25	-	V
		I <sub>O</sub> = -24 mA; V <sub>CC</sub> = 3.0 V	2.2	-	-	2.0	-	V

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
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> = 100 µA; V <sub>CC</sub> = 1.65 V to 3.6 V	-	-	0.2	-	0.3	V
		I <sub>O</sub> = 4 mA; V <sub>CC</sub> = 1.65 V	-	-	0.45	-	0.65	V
		I <sub>O</sub> = 8 mA; V <sub>CC</sub> = 2.3 V	-	-	0.6	-	0.8	V
		I <sub>O</sub> = 12 mA; V <sub>CC</sub> = 2.7 V	-	-	0.4	-	0.6	V
		I <sub>O</sub> = 24 mA; V <sub>CC</sub> = 3.0 V	-	-	0.55	-	0.8	V
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = 5.5 V or GND	-	±0.1	±5	-	±20	µA
I <sub>OFF</sub>	power-off leakage current	V <sub>CC</sub> = 0 V; V <sub>I</sub> or V <sub>O</sub> = 5.5 V	-	0.1	10	-	20	µA
I <sub>CC</sub>	supply current	V <sub>CC</sub> = 3.6 V; V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A	-	0.1	10	-	40	µA
ΔI <sub>CC</sub>	additional supply current	per input pin; V <sub>CC</sub> = 1.65 V to 3.6 V; V <sub>I</sub> = V <sub>CC</sub> - 0.6 V; I <sub>O</sub> = 0 A	-	5	500	-	5000	µA
C <sub>I</sub>	input capacitance	V <sub>CC</sub> = 0 V to 3.6 V; V <sub>I</sub> = GND to V <sub>CC</sub>	-	5.0	-	-	-	pF

[1] All typical values are measured at V<sub>CC</sub> = 3.3 V (unless stated otherwise) and T<sub>amb</sub> = 25 °C.

## 11 Dynamic characteristics

**Table 7. Dynamic characteristics**

Voltages are referenced to GND (ground = 0 V). For test circuit see [Figure 13](#).

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
t <sub>pd</sub>	propagation delay	SHCP to Q7S; see <a href="#">Figure 7</a> <sup>[2] [3]</sup>						
		V <sub>CC</sub> = 1.2 V	-	17.5	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	5.2	15.8	2.0	18.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	3.2	8.1	1.5	9.3	ns
		V <sub>CC</sub> = 2.7 V	1.5	3.5	7.6	1.5	8.7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.5	3.1	6.7	1.5	7.7	ns
		STCP to Qn; see <a href="#">Figure 8</a> <sup>[2]</sup>						
		V <sub>CC</sub> = 1.2 V	-	19.3	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	7.6	15.8	2.0	18.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	4.8	8.1	1.5	9.3	ns
		V <sub>CC</sub> = 2.7 V	1.5	5.2	7.6	1.5	8.7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.2	4.5	6.7	1.2	7.7	ns
t <sub>PHL</sub>	HIGH to LOW propagation delay	SHR to Q7S; see <a href="#">Figure 11</a>						
		V <sub>CC</sub> = 1.2 V	-	12.0	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	5.0	15.8	2.0	18.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	3.8	8.1	1.5	9.3	ns
		V <sub>CC</sub> = 2.7 V	1.2	3.9	7.6	1.2	8.7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.2	3.3	6.7	1.2	7.7	ns
		STR to Qn; see <a href="#">Figure 12</a>						
		V <sub>CC</sub> = 1.2 V	-	20.0	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	7.7	15.8	2.0	18.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	5.0	8.1	1.5	9.3	ns
		V <sub>CC</sub> = 2.7 V	1.2	5.3	7.6	1.2	8.7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.2	4.4	6.7	1.2	7.7	ns



Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
$t_W$	pulse width	SHCP, STCP HIGH or LOW; see <a href="#">Figure 7</a> and <a href="#">Figure 8</a>						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	6.0	2.5	-	7.0	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	5.0	2.0	-	5.5	-	ns
		$V_{CC} = 2.7 \text{ V}$	4.5	1.5	-	5.0	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	4.0	1.5	-	4.5	-	ns
		SHR, STR LOW; see <a href="#">Figure 11</a> and <a href="#">Figure 12</a>						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	6.0	2.5	-	5.5	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	4.0	2.0	-	4.5	-	ns
		$V_{CC} = 2.7 \text{ V}$	2.5	1.5	-	3.0	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.5	1.5	-	3.0	-	ns
$t_{su}$	set-up time	DS to SHCP; see <a href="#">Figure 9</a>						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	5.0	1.0	-	5.5	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	4.0	0.8	-	4.5	-	ns
		$V_{CC} = 2.7 \text{ V}$	2.0	0.6	-	2.5	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	2.0	0.6	-	2.5	-	ns
		SHR to STCP; see <a href="#">Figure 10</a>						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	8.0	3.5	-	8.5	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	5.0	2.1	-	5.5	-	ns
		$V_{CC} = 2.7 \text{ V}$	4.0	1.8	-	4.5	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	4.0	1.7	-	4.5	-	ns
		SHCP to STCP; see <a href="#">Figure 8</a>						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	8.0	3.5	-	8.5	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	5.0	2.1	-	5.5	-	ns
		$V_{CC} = 2.7 \text{ V}$	4.0	1.8	-	4.5	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	4.0	1.7	-	4.5	-	ns
$t_h$	hold time	DS to SHCP; see <a href="#">Figure 9</a> <sup>[3]</sup>						
		$V_{CC} = 1.65 \text{ V to } 1.95 \text{ V}$	1.5	0.2	-	2.0	-	ns
		$V_{CC} = 2.3 \text{ V to } 2.7 \text{ V}$	1.5	0.1	-	2.0	-	ns
		$V_{CC} = 2.7 \text{ V}$	1.5	-0.1	-	2.0	-	ns
		$V_{CC} = 3.0 \text{ V to } 3.6 \text{ V}$	1.0	-0.2	-	1.5	-	ns

Symbol	Parameter	Conditions	-40 °C to +85 °C			-40 °C to +125 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
t <sub>rec</sub>	recovery time	SHR to SHCP, STR to STCP; see <a href="#">Figure 11</a> and <a href="#">Figure 12</a>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	5.0	-2.7	-	5.5	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	4.0	-1.5	-	4.5	-	ns
		V <sub>CC</sub> = 2.7 V	2.0	-1.0	-	2.5	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-1.0	-	2.5	-	ns
f <sub>max</sub>	maximum frequency	SHCP or STCP; see <a href="#">Figure 7</a> and <a href="#">Figure 8</a>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	80	130	-	70	-	MHz
		V <sub>CC</sub> = 2.3 V to 2.7 V	100	140	-	90	-	MHz
		V <sub>CC</sub> = 2.7 V	110	150	-	100	-	MHz
		V <sub>CC</sub> = 3.0 V to 3.6 V	130	180	-	115	-	MHz
t <sub>sk(o)</sub>	output skew time	V <sub>CC</sub> = 3.0 V to 3.6 V <sup>[4]</sup>	-	-	1.0	-	1.5	ns
C <sub>PD</sub>	power dissipation capacitance	V <sub>I</sub> = GND to V <sub>CC</sub> <sup>[5]</sup>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	-	50	-	-	-	pF
		V <sub>CC</sub> = 2.3 V to 2.7 V	-	45	-	-	-	pF
		V <sub>CC</sub> = 3.0 V to 3.6 V	-	44	-	-	-	pF

[1] Typical values are measured at T<sub>amb</sub> = 25 °C and V<sub>CC</sub> = 1.8 V, 2.5 V, 2.7 V, and 3.3 V respectively.

[2] t<sub>pd</sub> is the same as t<sub>PLH</sub> and t<sub>PHL</sub>.

[3] Cascadability is guaranteed under identical V<sub>CC</sub> and temperature conditions.

[4] Skew between any two outputs of the same package switching in the same direction. This parameter is guaranteed by design.

[5] 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;

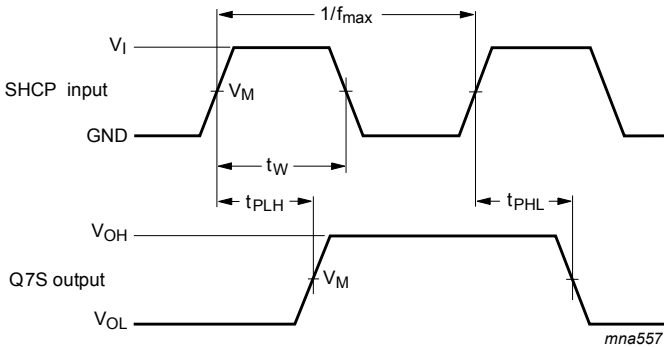
C<sub>L</sub> = output load capacitance in pF;

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

N = number of inputs switching;

$\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

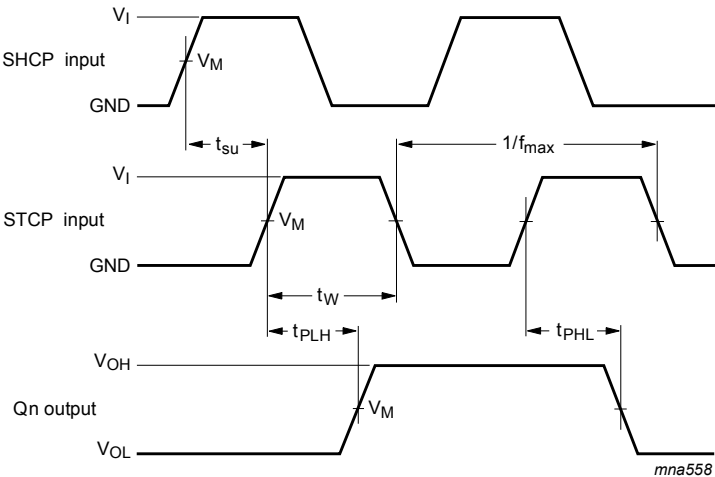
11.1 Waveforms and test circuit



Measurement points are given in [Table 8](#).

$V_{OL}$  and  $V_{OH}$  are typical output voltage drops that occur with the output load.

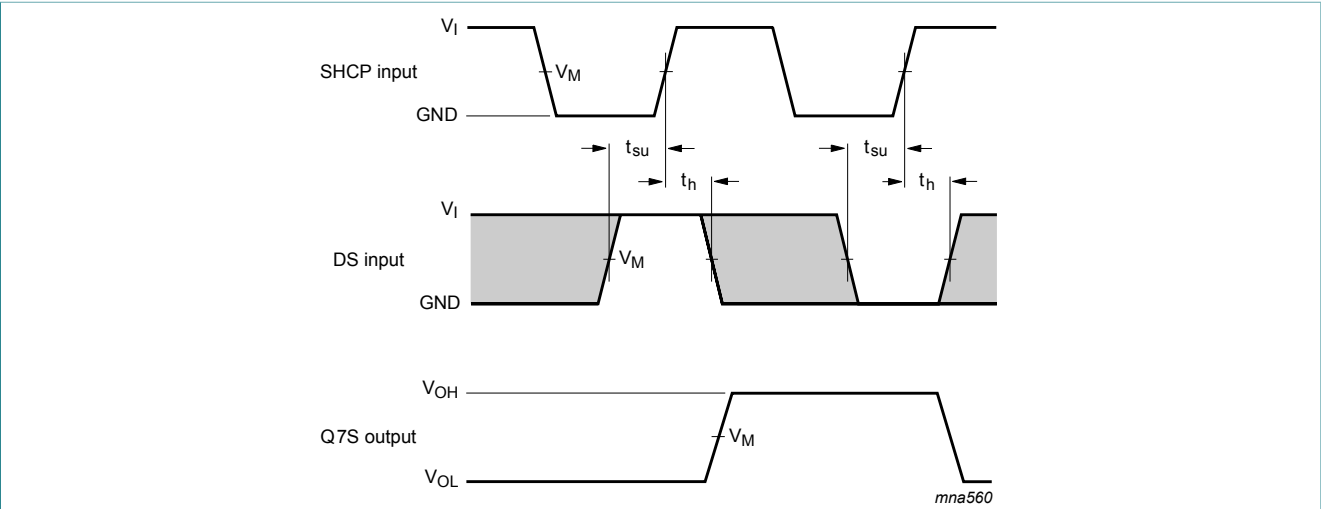
**Figure 7. The shift clock (SHCP) to serial data output (Q7S) propagation delays, the shift clock pulse width and maximum shift clock frequency**



Measurement points are given in [Table 8](#).

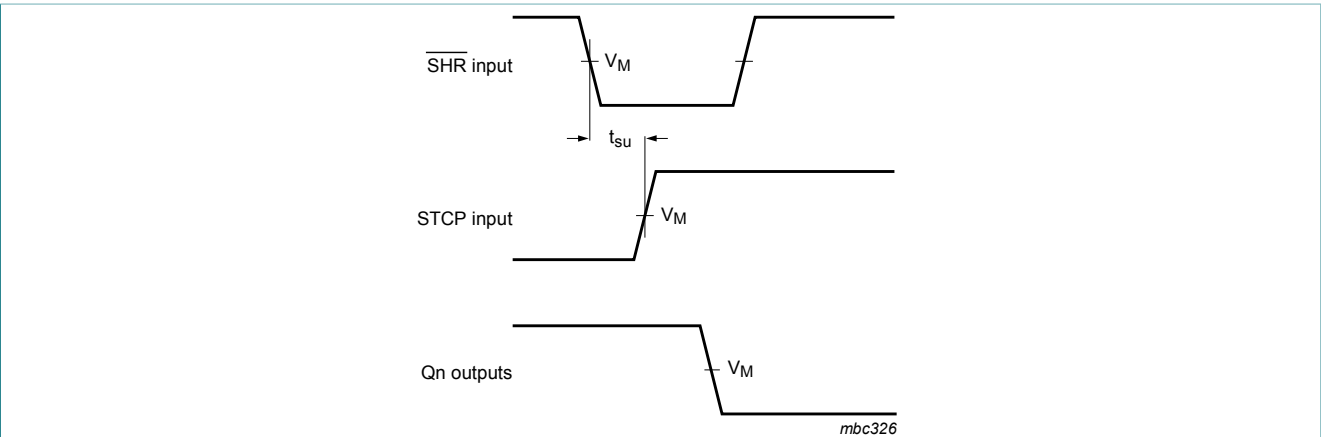
$V_{OL}$  and  $V_{OH}$  are typical output voltage drops that occur with the output load.

**Figure 8. The storage clock (STCP) to parallel data output (Qn) propagation delays, the storage clock pulse width and the shift clock to storage clock set-up time**



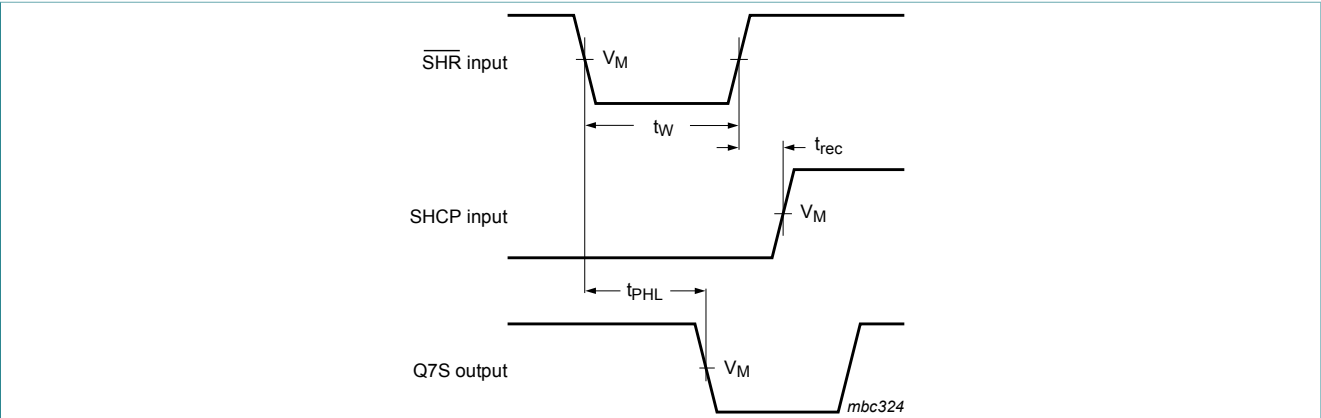
Measurement points are given in [Table 8](#).  
The shaded areas indicate when the input is permitted to change for predictable output performance.  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage drops that occur with the output load.

Figure 9. The data set-up and hold times for the serial data input (DS)

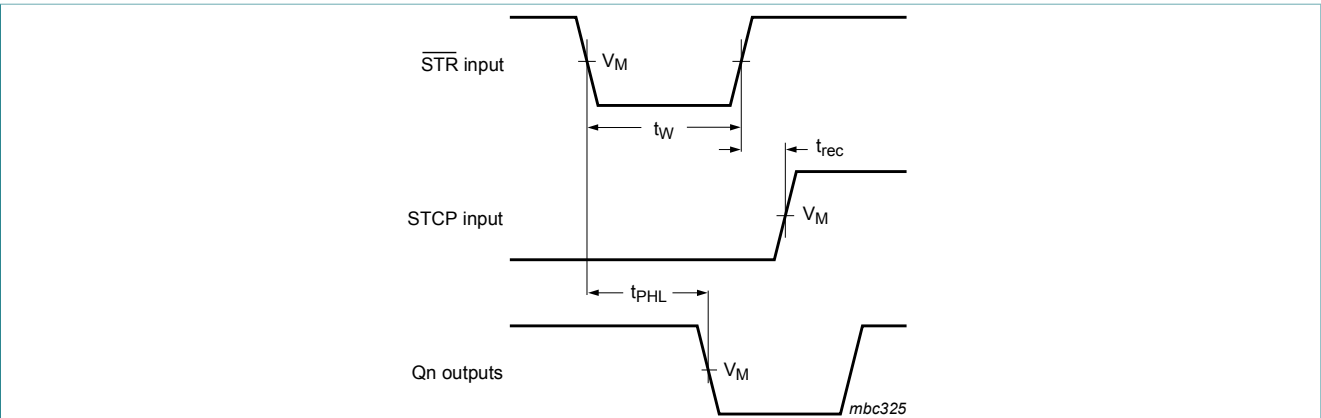


Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage drops that occur with the output load.

Figure 10. The shift reset (SHR) to storage clock (STCP) set-up times



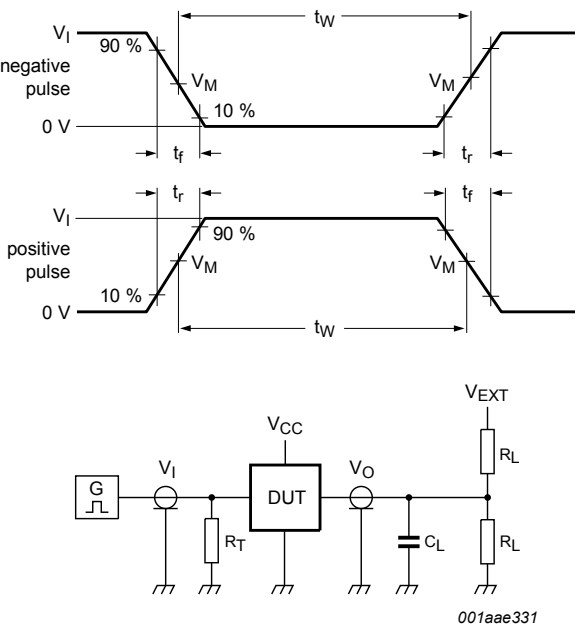
Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage drops that occur with the output load.  
**Figure 11. The shift reset ( $\overline{\text{SHR}}$ ) pulse width, the shift reset to serial data output (Q7S) propagation delays and the shift reset to shift clock (SHCP) recovery time**



Measurement points are given in [Table 8](#).  
 $V_{OL}$  and  $V_{OH}$  are typical output voltage drops that occur with the output load.  
**Figure 12. The storage reset ( $\overline{\text{STR}}$ ) pulse width, the storage reset to parallel data output (Qn) propagation delays and the storage reset to storage clock (STCP) recovery time**

**Table 8. Measurement points**

Supply voltage	Input	Output
$V_{CC}$	$V_M$	$V_M$
$V_{CC} < 2.7\text{ V}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$
$V_{CC} \geq 2.7\text{ V}$	1.5 V	1.5 V



Test data is given in [Table 9](#). Definitions for test circuit:

$R_L$  = Load resistance.

$C_L$  = Load capacitance including jig and probe capacitance.

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

$V_{EXT}$  = External voltage for measuring switching times.

Figure 13. Test circuit for measuring switching times

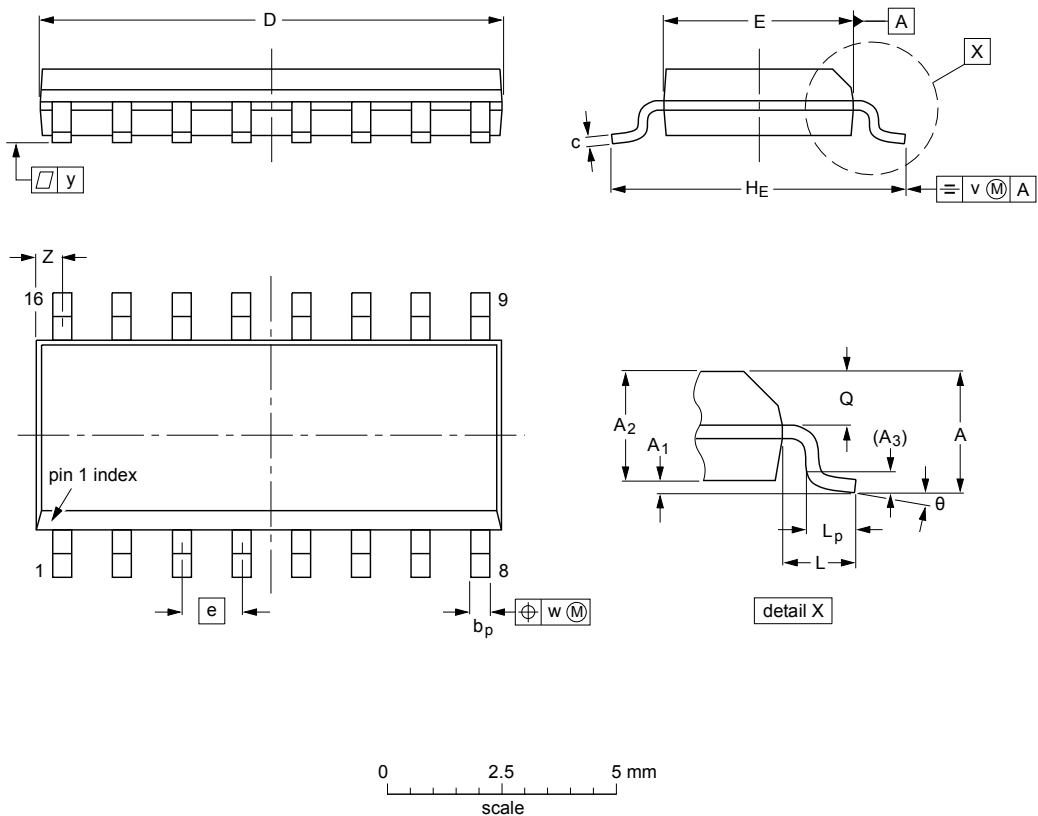
Table 9. Test data

Supply voltage	Input		Load		$V_{EXT}$		
	$V_I$	$t_r, t_f$	$C_L$	$R_L$	$t_{PLH}, t_{PHL}$	$t_{PLZ}, t_{PZL}$	$t_{PHZ}, t_{PZH}$
1.2 V	$V_{CC}$	$\leq 2$ ns	30 pF	1 k $\Omega$	open	2 x $V_{CC}$	GND
1.65 V to 1.95 V	$V_{CC}$	$\leq 2$ ns	30 pF	1 k $\Omega$	open	2 x $V_{CC}$	GND
2.3 V to 2.7 V	$V_{CC}$	$\leq 2$ ns	30 pF	500 $\Omega$	open	2 x $V_{CC}$	GND
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	2 x $V_{CC}$	GND
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	2 x $V_{CC}$	GND

12 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 <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	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° 0°
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.


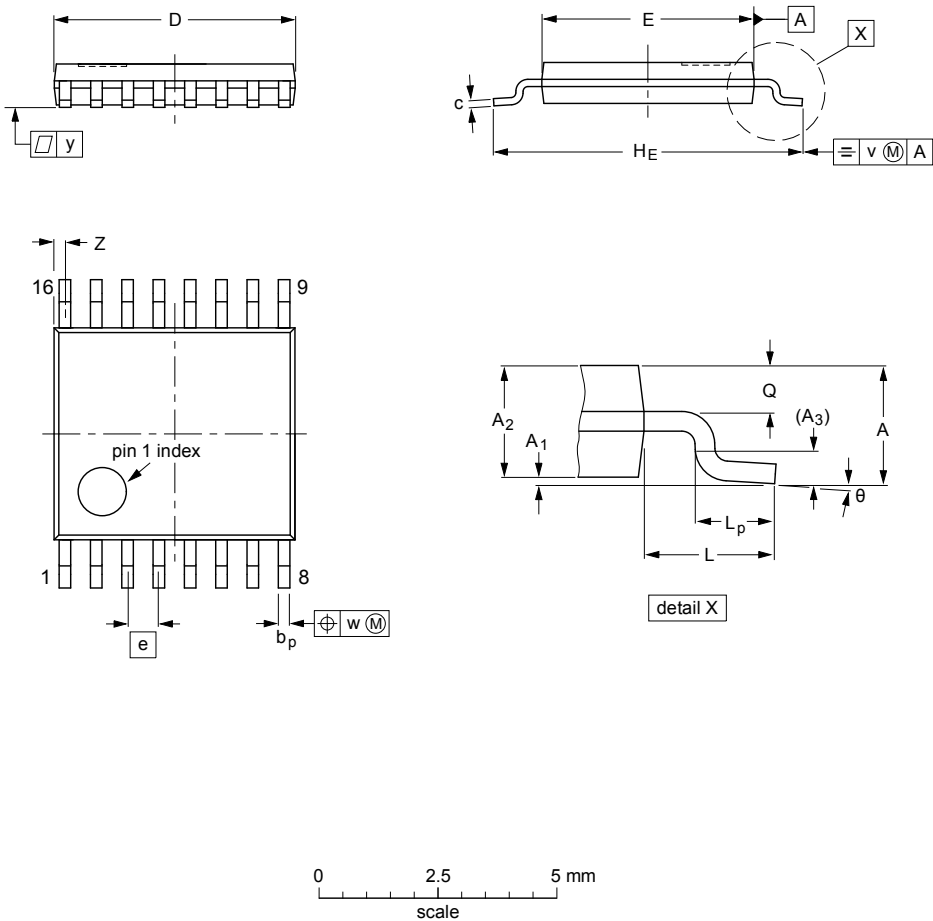
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT109-1	076E07	MS-012				99-12-27 03-02-19

Figure 14. Package outline SOT109-1 (SO16)

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 <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	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° 0°

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.

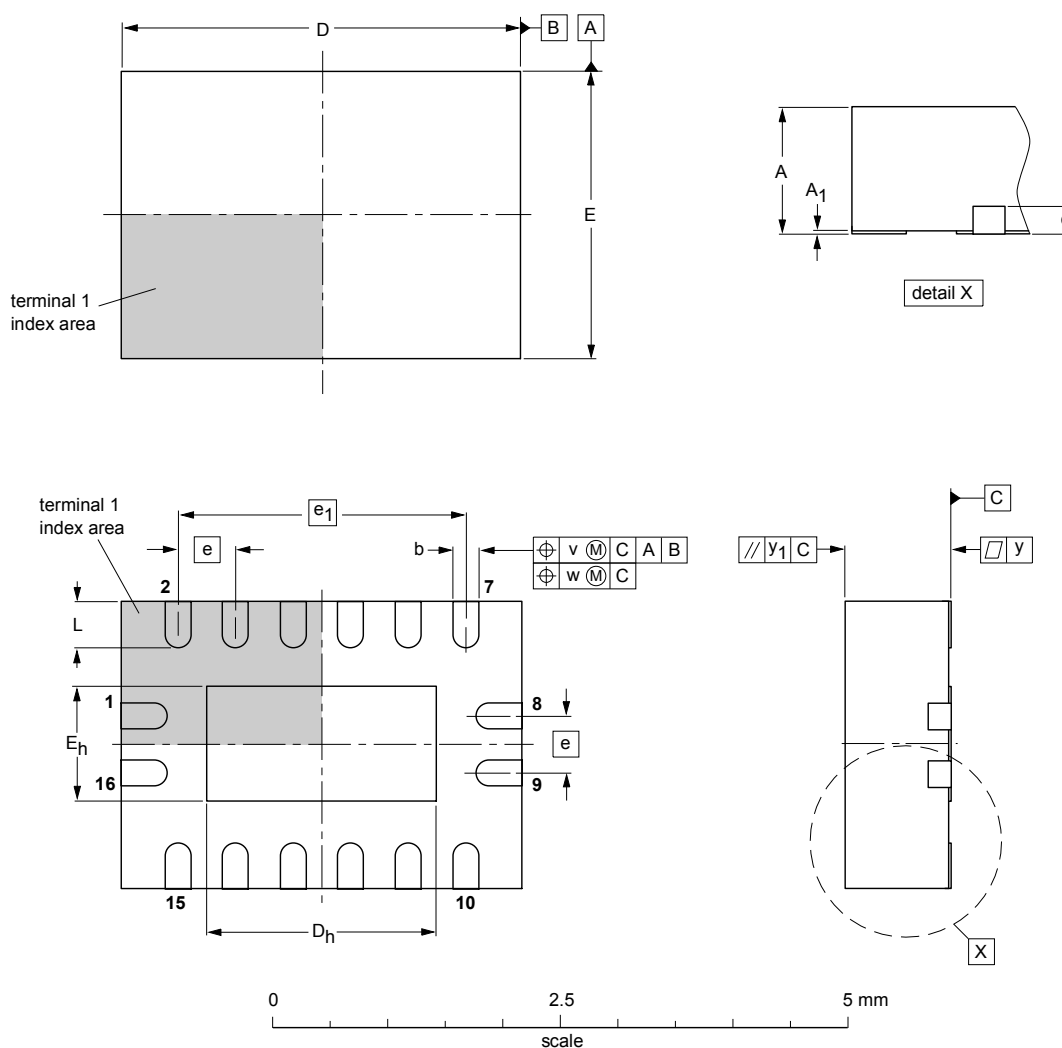
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT403-1		MO-153				99-12-27 03-02-18

Figure 15. 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**



**Figure 16. 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
TTL	Transistor-Transistor Logic

## 14 Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC594A v.3	20170720	Product data sheet	-	74LVC594A 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="#">Table 7</a>: table note added for cascading purposes.</li></ul>			
74LVC594A v.2	20131021	Product data sheet	-	74LVC594A 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></ul>			
74LVC594A v.1	20070524	Product data sheet	-	-

## 15 Legal information

### 15.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.nexperia.com>.

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