

# 74LVC595A

8-bit serial-in/serial-out or parallel-out shift register; 3-state

Rev. 01 — 29 May 2007

Product data sheet

## 1. General description

---

The 74LVC595A is an 8-bit serial-in/serial or parallel-out shift register with a storage register and 3-state outputs. Both the shift and storage register have separate clocks.

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.

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.

The shift register has a serial input (DS) and a serial output (Q7S) for cascading purposes. It is also provided with asynchronous reset input  $\overline{MR}$  (active LOW) for all 8 shift register stages. The storage register has 8 parallel 3-state bus driver outputs. Data in the storage register appears at the output whenever the output enable input ( $\overline{OE}$ ) is LOW.

## 2. Features

---

- 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-B/JESD36
- ESD protection:
  - ◆ HBM JESD22-A114-D exceeds 2000 V
  - ◆ CDM JESD22-C101-C exceeds 1000 V
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$ .

## 3. Applications

---

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

### 4. Ordering information

Table 1. Ordering information

Type number	Package			Version
	Temperature range	Name	Description	
74LVC595AD	-40 °C to +125 °C	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1
74LVC595APW	-40 °C to +125 °C	TSSOP16	plastic thin shrink small outline package; 16 leads; body width 4.4 mm	SOT403-1
74LVC595ABQ	-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

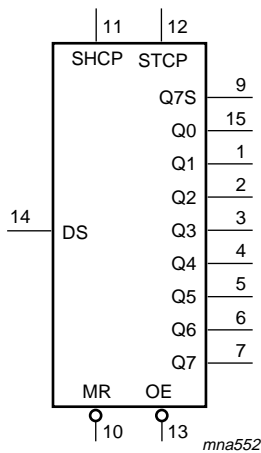


Fig 1. Logic symbol

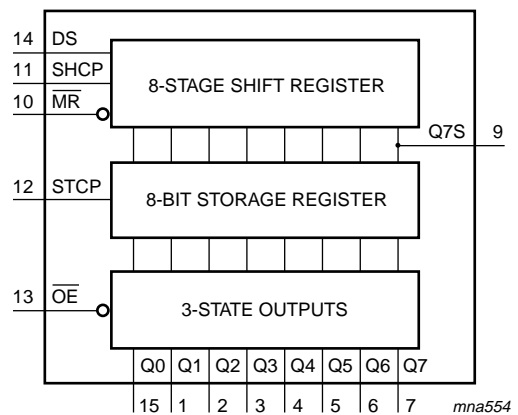


Fig 2. Functional diagram

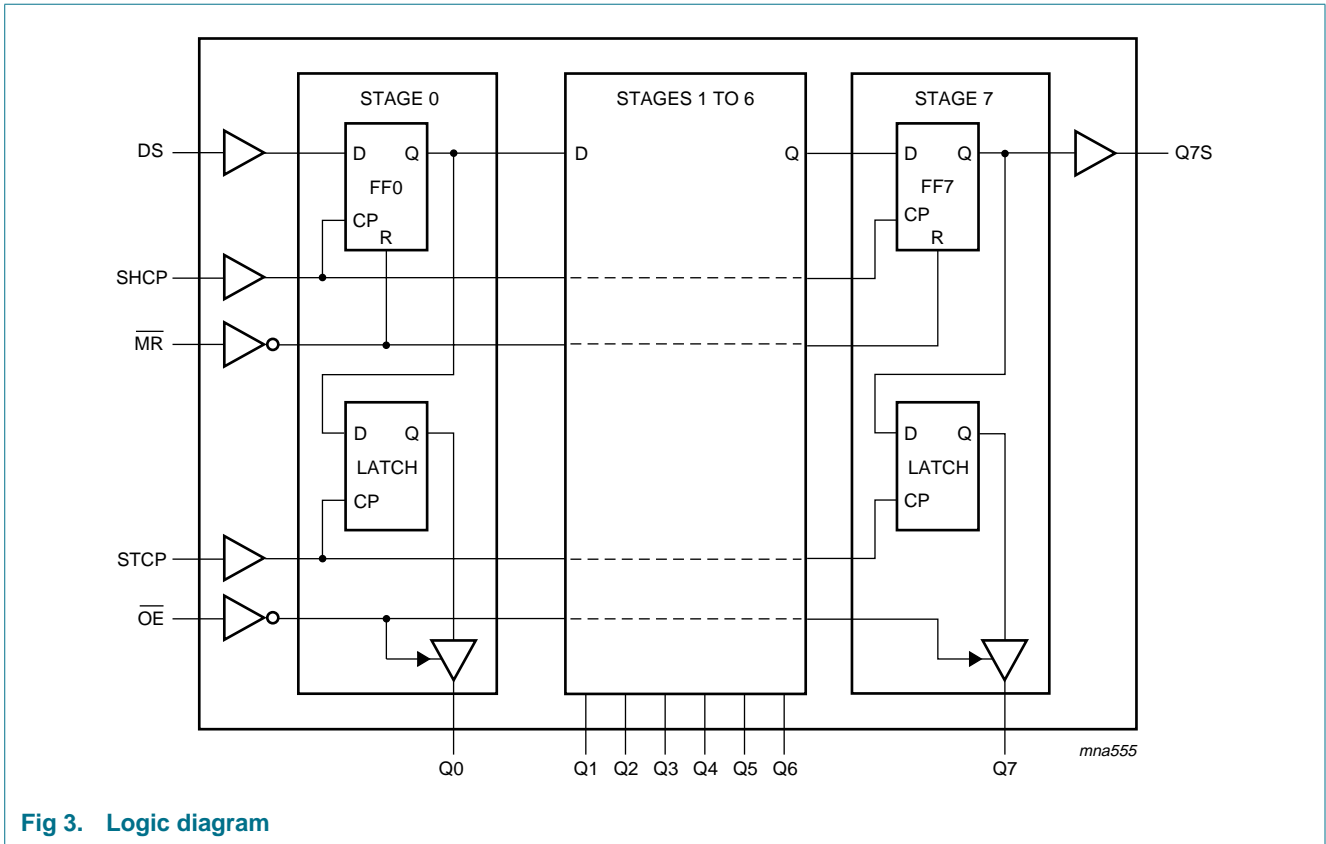


Fig 3. Logic diagram

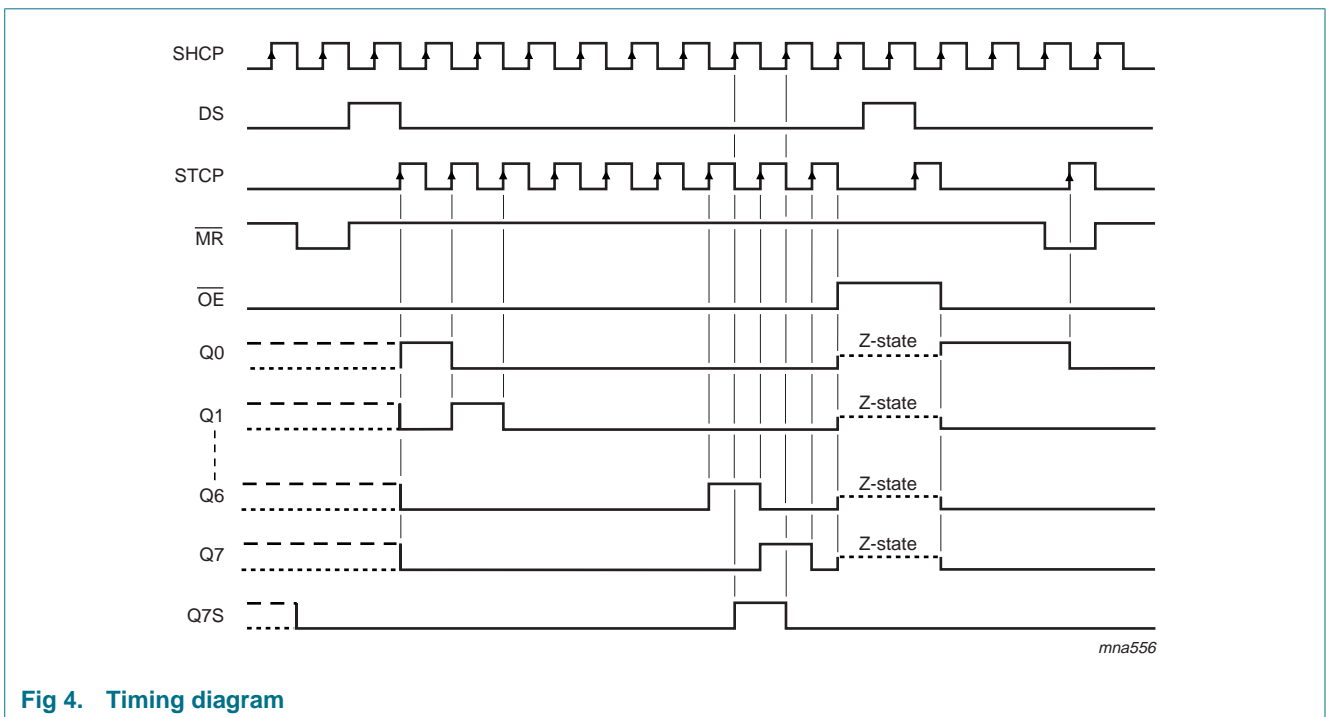
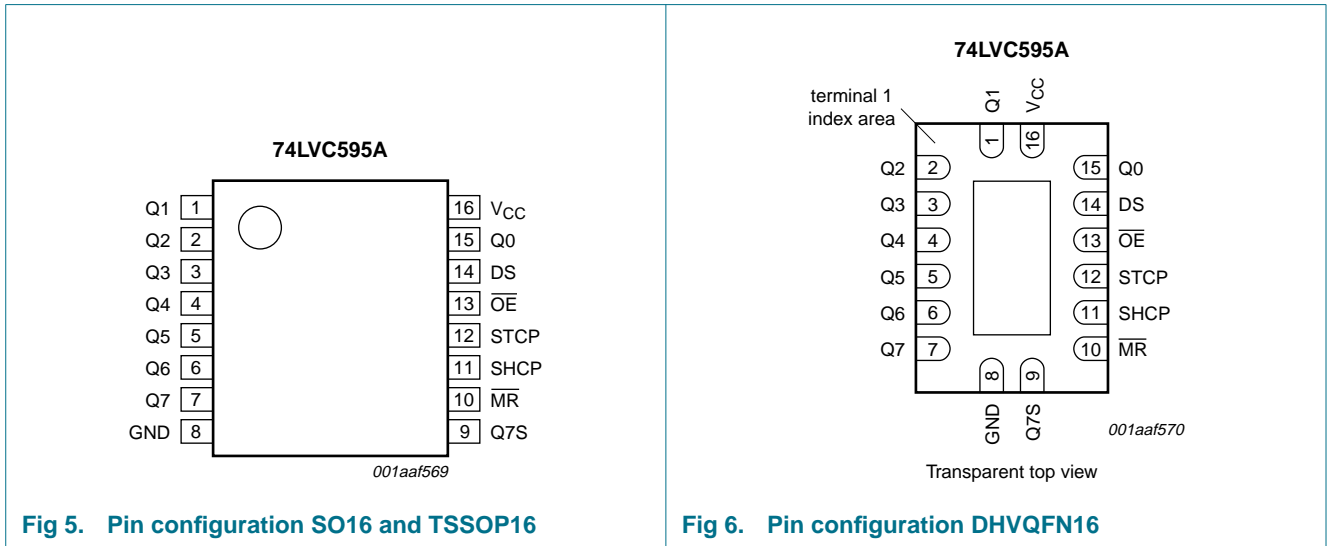


Fig 4. Timing diagram

## 6. Pinning information

### 6.1 Pinning



### 6.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
Q[0:7]	15, 1, 2, 3, 4, 5, 6, 7	parallel data output
GND	8	ground (0 V)
Q7S	9	serial data output
MR	10	master reset (active LOW)
SHCP	11	shift register clock input
STCP	12	storage register clock input
OE	13	output enable input (active LOW)
DS	14	serial data input
V <sub>CC</sub>	16	supply voltage

## 7. Functional description

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

Input					Output		Function
SHCP	STCP	$\overline{OE}$	$\overline{MR}$	DS	Q7S	Qn	
X	X	L	L	X	L	NC	a LOW-state on $\overline{MR}$ only affects the shift register
X	↑	L	L	X	L	L	empty shift register loaded into storage register
X	X	H	L	X	L	Z	shift register clear; parallel outputs in high impedance OFF-state
↑	X	L	H	H	Q6S	NC	logic HIGH-state 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	↑	L	H	X	NC	QnS	contents of shift register stages (internal QnS) are transferred to the storage register and parallel output stages
↑	↑	L	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;  
 Z = high-impedance OFF-state.

## 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		[1] -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	[1] -0.5	6.5	V
		output HIGH or LOW state	[1] -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	[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 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	0	-	20	ns/V
		V <sub>CC</sub> = 2.7 V to 3.6 V	0	-	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	0.65 × V <sub>CC</sub>	-	-	0.65 × V <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	-	-	0.35 × V <sub>CC</sub>	-	0.35 × V <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
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

**Table 6. Static characteristics ...continued**

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	
I <sub>OZ</sub>	OFF-state output current	V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>O</sub> = 5.5 V or GND; V <sub>CC</sub> = 3.6 V	-	0.1	±10	-	±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.

[2] For transceivers, the parameter I<sub>OZ</sub> includes the input leaking current.

## 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>	[2]					
		V <sub>CC</sub> = 1.2 V	-	17.5	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	6.6	15.8	2.0	18.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	4.2	8.1	1.5	9.3	ns
		V <sub>CC</sub> = 2.7 V	1.5	4.7	7.6	1.5	8.7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.5	4.0	6.7	1.5	7.7	ns
		STCP to Qn; see <a href="#">Figure 8</a>	[2]					
		V <sub>CC</sub> = 1.2 V	-	16.8	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	5.8	15.8	2.0	18.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	3.7	8.1	1.5	9.3	ns
t <sub>PHL</sub>	HIGH to LOW propagation delay	MR to Q7S; see <a href="#">Figure 11</a>						
		V <sub>CC</sub> = 1.2 V	-	17.3	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	6.9	15.8	2.0	18.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	4.3	8.1	1.5	9.3	ns
		V <sub>CC</sub> = 2.7 V	1.5	4.5	7.6	1.5	8.7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.2	3.8	6.7	1.2	7.7	ns

**Table 7. Dynamic characteristics ...continued**

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>en</sub>	enable time	OE to Qn; see <a href="#">Figure 12</a> <sup>[3]</sup>						
		V <sub>CC</sub> = 1.2 V	-	17.9	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	6.4	14.1	2.0	16.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	4.2	8.0	1.5	9.2	ns
		V <sub>CC</sub> = 2.7 V	1.5	4.5	7.6	1.5	8.7	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.2	3.8	6.7	1.2	7.7	ns
t <sub>dis</sub>	disable time	OE to Qn; see <a href="#">Figure 12</a> <sup>[4]</sup>						
		V <sub>CC</sub> = 1.2 V	-	9.6	-	-	-	ns
		V <sub>CC</sub> = 1.65 V to 1.95 V	2.0	4.9	9.8	2.0	11.2	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.2	2.8	5.8	1.2	6.6	ns
		V <sub>CC</sub> = 2.7 V	1.5	3.7	6.2	1.5	7.1	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	1.2	3.5	5.7	1.2	6.5	ns
t <sub>w</sub>	pulse width	SHCP, STCP HIGH or LOW; see <a href="#">Figure 7</a> and <a href="#">Figure 8</a>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	6.0	2.5	-	7.0	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	5.0	2.0	-	5.5	-	ns
		V <sub>CC</sub> = 2.7 V	4.5	1.5	-	5.0	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	4.0	1.5	-	4.5	-	ns
		MR LOW; see <a href="#">Figure 11</a>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	5.0	2.0	-	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	2.5	1.0	-	3.0	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.5	1.0	-	3.0	-	ns
t <sub>su</sub>	set-up time	DS to SHCP; see <a href="#">Figure 9</a>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	5.0	0.4	-	5.5	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	4.0	0.1	-	4.5	-	ns
		V <sub>CC</sub> = 2.7 V	2.0	0	-	2.5	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	2.0	-0.1	-	2.5	-	ns
		MR to STCP; see <a href="#">Figure 10</a>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	8.0	3.5	-	8.5	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	5.0	2.1	-	5.5	-	ns
		V <sub>CC</sub> = 2.7 V	4.0	1.8	-	4.5	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	4.0	1.7	-	4.5	-	ns
		SHCP to STCP; see <a href="#">Figure 8</a>						
		V <sub>CC</sub> = 1.65 V to 1.95 V	8.0	3.5	-	8.5	-	ns
		V <sub>CC</sub> = 2.3 V to 2.7 V	5.0	2.1	-	5.5	-	ns
		V <sub>CC</sub> = 2.7 V	4.0	1.8	-	4.5	-	ns
		V <sub>CC</sub> = 3.0 V to 3.6 V	4.0	1.7	-	4.5	-	ns



**Table 7. Dynamic characteristics ...continued**

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>h</sub>	hold time	DS to SHCP; see <a href="#">Figure 9</a>							
		V <sub>CC</sub> = 1.65 V to 1.95 V	1.5	0.2	-	2.0	-	ns	
		V <sub>CC</sub> = 2.3 V to 2.7 V	1.5	0.1	-	2.0	-	ns	
		V <sub>CC</sub> = 2.7 V	1.5	-0.1	-	2.0	-	ns	
t <sub>rec</sub>	recovery time	M $\bar{R}$ to SHCP; see <a href="#">Figure 11</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	
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	
t <sub>sk(o)</sub>	output skew time	V <sub>CC</sub> = 3.0 V to 3.6 V	<a href="#">[5]</a>	-	-	1.0	-	1.5	ns
		C <sub>PD</sub>	power dissipation capacitance	V <sub>I</sub> = GND to V <sub>CC</sub>	<a href="#">[6]</a>				
		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] t<sub>en</sub> is the same as t<sub>PZH</sub> and t<sub>PZL</sub>.

[4] t<sub>dis</sub> is the same as t<sub>PHZ</sub> and t<sub>PLZ</sub>.

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

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

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

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

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

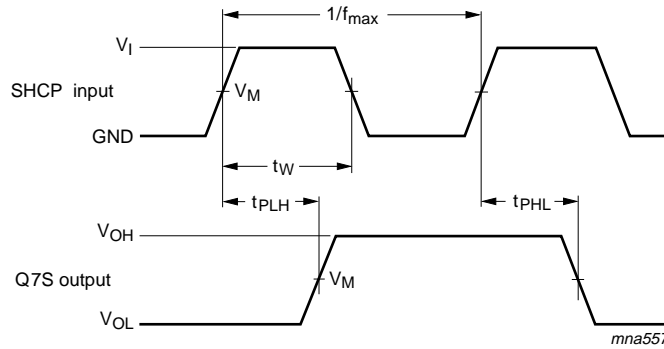
C<sub>L</sub> = output load capacitance in pF;

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 outputs.

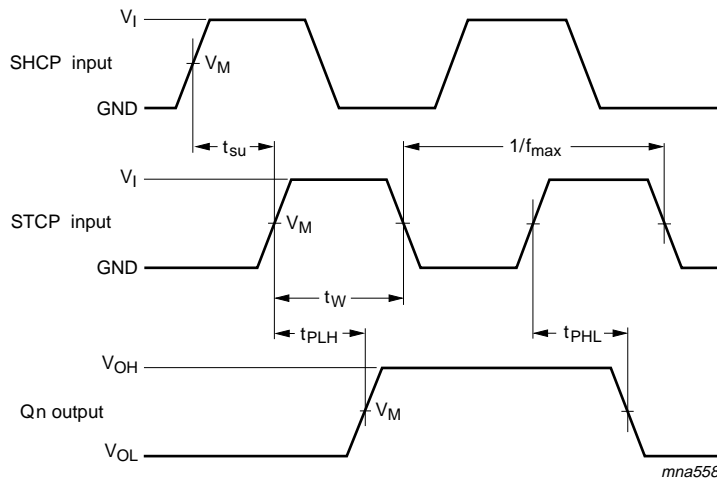
12. Waveforms



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

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

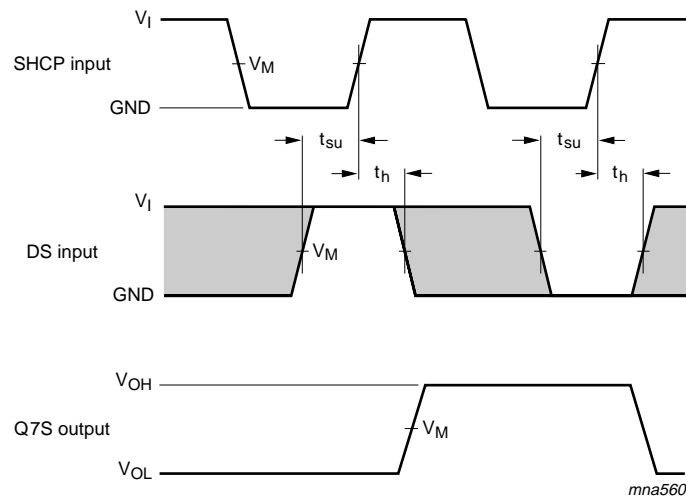
**Fig 7. The shift clock (SHCP) to serial data output (Q7S) propagation delays, the shift clock pulse width and maximum shift clock frequency**



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

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

**Fig 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**

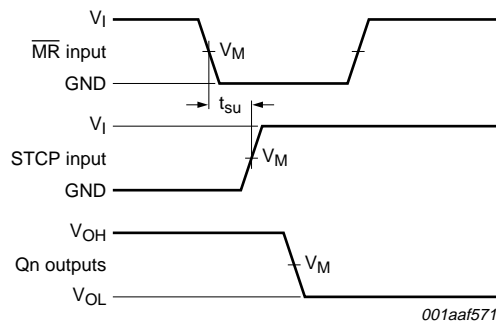


Measurement points are given in [Table 8](#).

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.

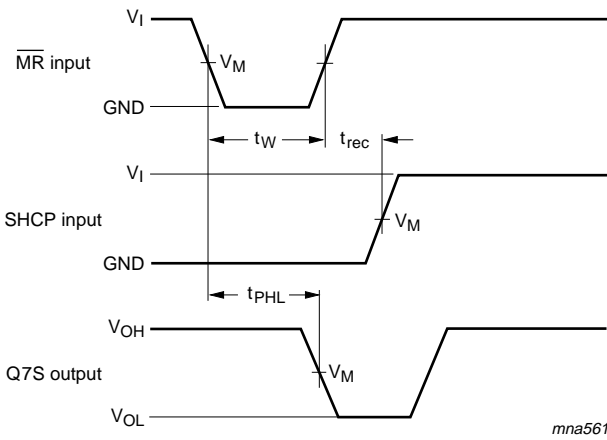
**Fig 9. The data set-up and hold times for the serial data input (DS)**



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

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

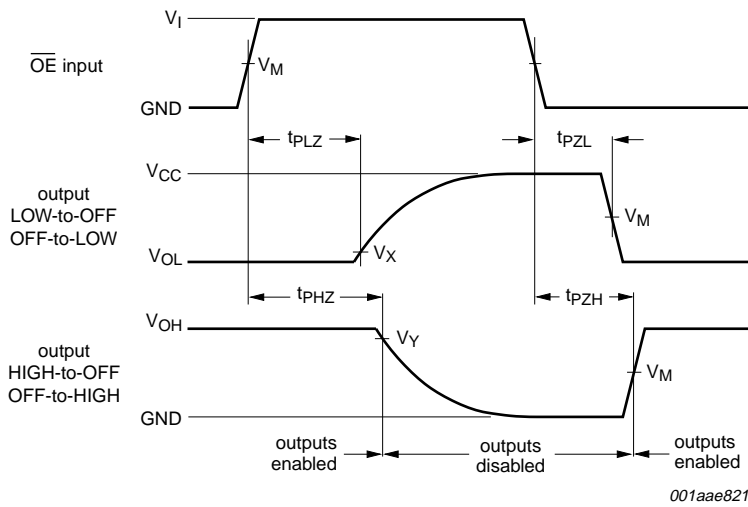
**Fig 10. The master reset ( $\overline{MR}$ ) to storage clock (STCP) set-up times**



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

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

**Fig 11. The master reset ( $\overline{MR}$ ) pulse width, the master reset to serial data output (Q7S) propagation delays and the master reset to shift clock (SHCP) recovery time**



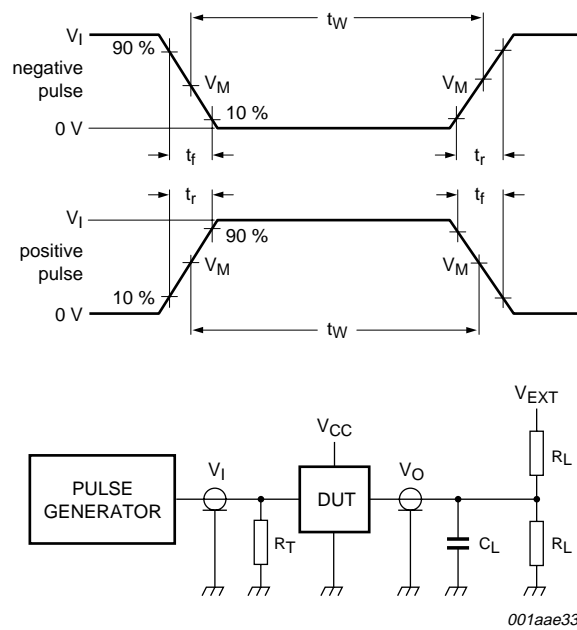
Measurement points are given in [Table 8](#).

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

**Fig 12. 3-state enable and disable times**

**Table 8. Measurement points**

Supply voltage	Input	Output		
$V_{CC}$	$V_M$	$V_M$	$V_X$	$V_Y$
$V_{CC} < 2.7\text{ V}$	$0.5 \times V_{CC}$	$0.5 \times V_{CC}$	$V_{OL} + 0.15\text{ V}$	$V_{OH} - 0.15\text{ V}$
$V_{CC} \geq 2.7\text{ V}$	1.5 V	1.5 V	$V_{OL} + 0.3\text{ V}$	$V_{OH} - 0.3\text{ V}$



001aae331

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.

**Fig 13. Load circuitry for 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	$2 \times V_{CC}$	GND
1.65 V to 1.95 V	$V_{CC}$	$\leq 2$ ns	30 pF	1 k $\Omega$	open	$2 \times V_{CC}$	GND
2.3 V to 2.7 V	$V_{CC}$	$\leq 2$ ns	30 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
2.7 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND
3.0 V to 3.6 V	2.7 V	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	$2 \times V_{CC}$	GND

13. Package outline

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

SOT109-1

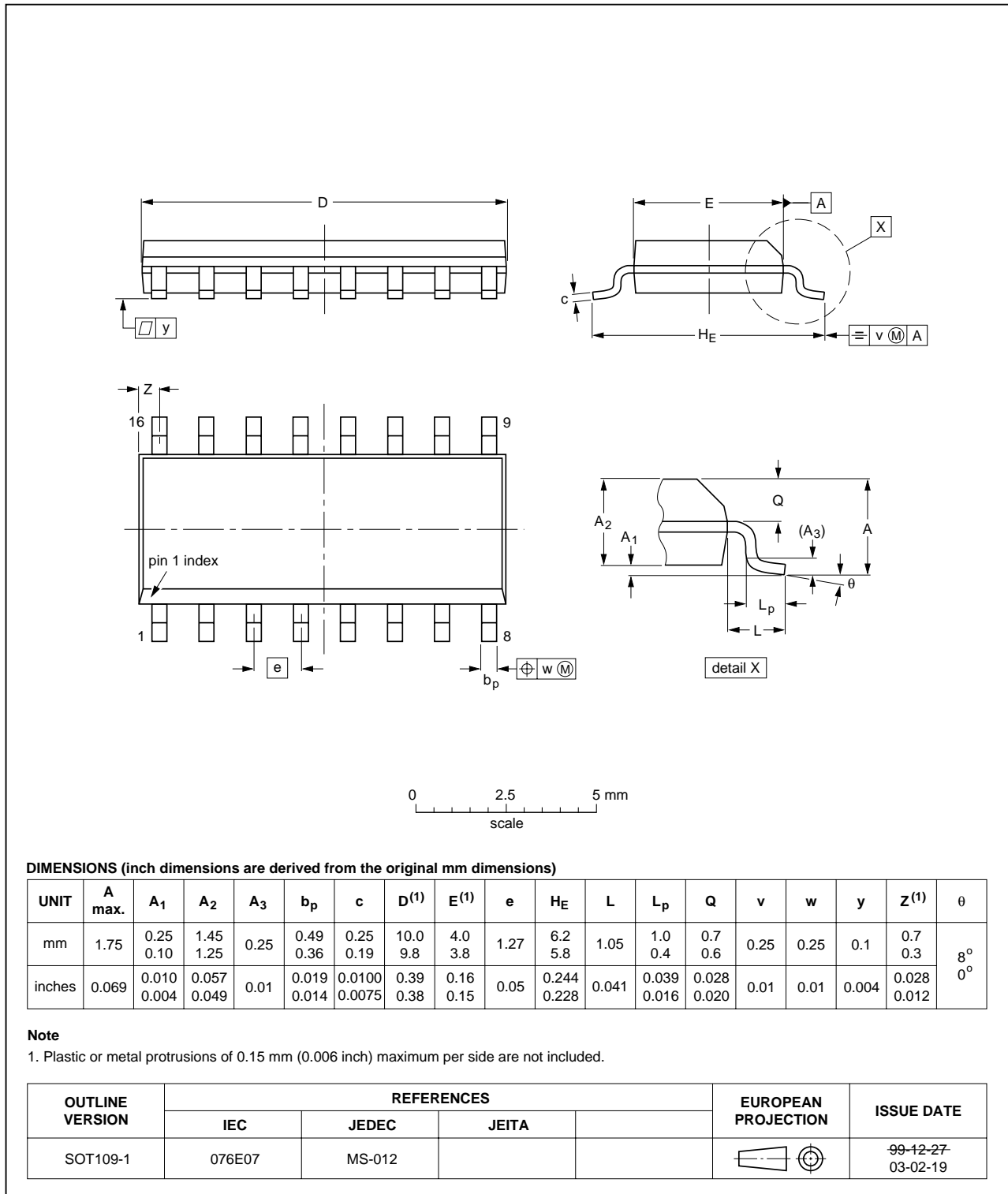


Fig 14. Package outline SOT109-1 (SO16)

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

SOT403-1

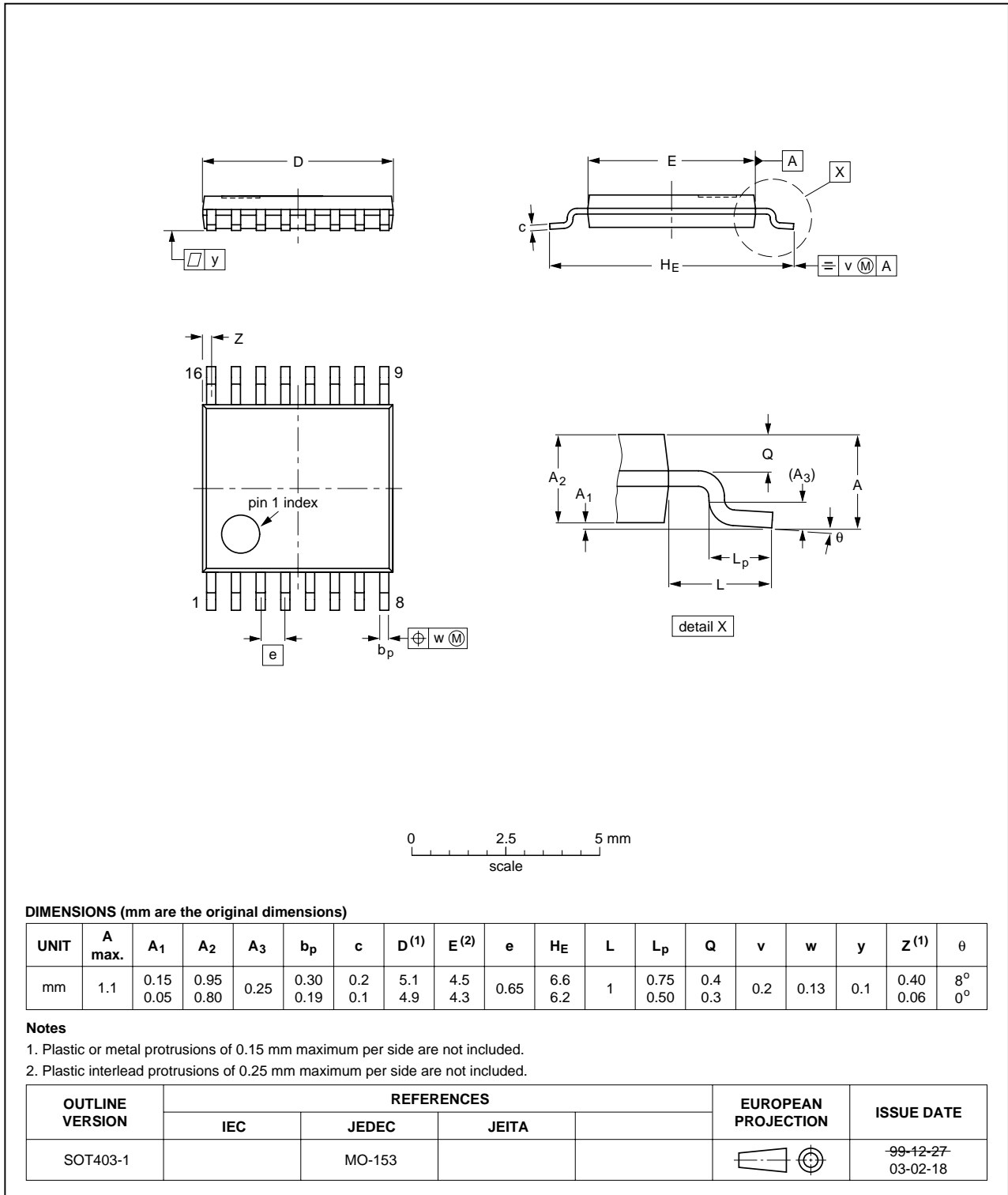


Fig 15. Package outline SOT403-1 (TSSOP16)

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

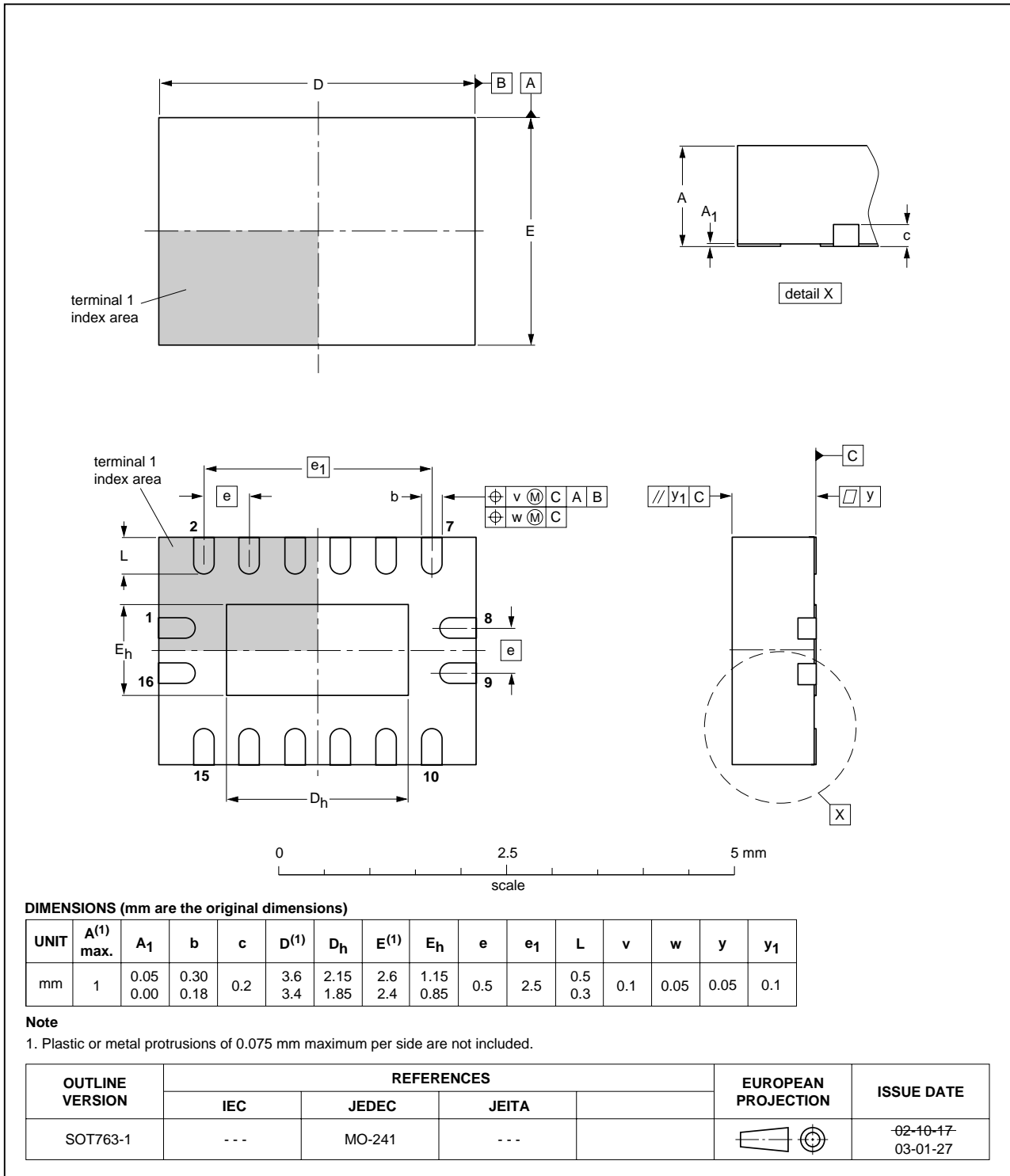


Fig 16. Package outline SOT763-1 (DHVQFN16)



## 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
TTL	Transistor-Transistor Logic

## 15. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74LVC595A_1	20070529	Product data sheet	-	-

## 16. Legal information

### 16.1 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.nxp.com>.

### 16.2 Definitions

**Draft** — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

**Short data sheet** — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

### 16.3 Disclaimers

**General** — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information.

**Right to make changes** — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

**Suitability for use** — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in medical, military, aircraft, space or life support equipment, nor in applications where failure or

malfunction of a NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors accepts no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

**Applications** — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

**Limiting values** — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) may cause permanent damage to the device. Limiting values are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of this document is not implied. Exposure to limiting values for extended periods may affect device reliability.

**Terms and conditions of sale** — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, including those pertaining to warranty, intellectual property rights infringement and limitation of liability, unless explicitly otherwise agreed to in writing by NXP Semiconductors. In case of any inconsistency or conflict between information in this document and such terms and conditions, the latter will prevail.

**No offer to sell or license** — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

### 16.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

## 17. Contact information

For additional information, please visit: <http://www.nxp.com>

For sales office addresses, send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

**18. Contents**

1 **General description** ..... 1

2 **Features** ..... 1

3 **Applications** ..... 1

4 **Ordering information** ..... 2

5 **Functional diagram** ..... 2

6 **Pinning information** ..... 4

6.1 Pinning ..... 4

6.2 Pin description ..... 4

7 **Functional description** ..... 5

8 **Limiting values** ..... 5

9 **Recommended operating conditions** ..... 6

10 **Static characteristics** ..... 6

11 **Dynamic characteristics** ..... 7

12 **Waveforms** ..... 10

13 **Package outline** ..... 14

14 **Abbreviations** ..... 17

15 **Revision history** ..... 17

16 **Legal information** ..... 18

16.1 Data sheet status ..... 18

16.2 Definitions ..... 18

16.3 Disclaimers ..... 18

16.4 Trademarks ..... 18

17 **Contact information** ..... 18

18 **Contents** ..... 19

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.



© NXP B.V. 2007.

All rights reserved.

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: [salesaddresses@nxp.com](mailto:salesaddresses@nxp.com)

Date of release: 29 May 2007

Document identifier: 74LVC595A\_1