

# 74F269

## 8-bit bidirectional binary counter

Rev. 03 — 26 January 2010

Product data sheet

### 1. General description

The 74F269 is a fully synchronous 8-stage up/down counter featuring a preset capability for programmable operation, carry look-ahead for easy cascading and a  $U/\bar{D}$  input to control the direction of counting. All state changes, whether in counting or parallel loading, are initiated by the rising edge of the clock.

### 2. Features

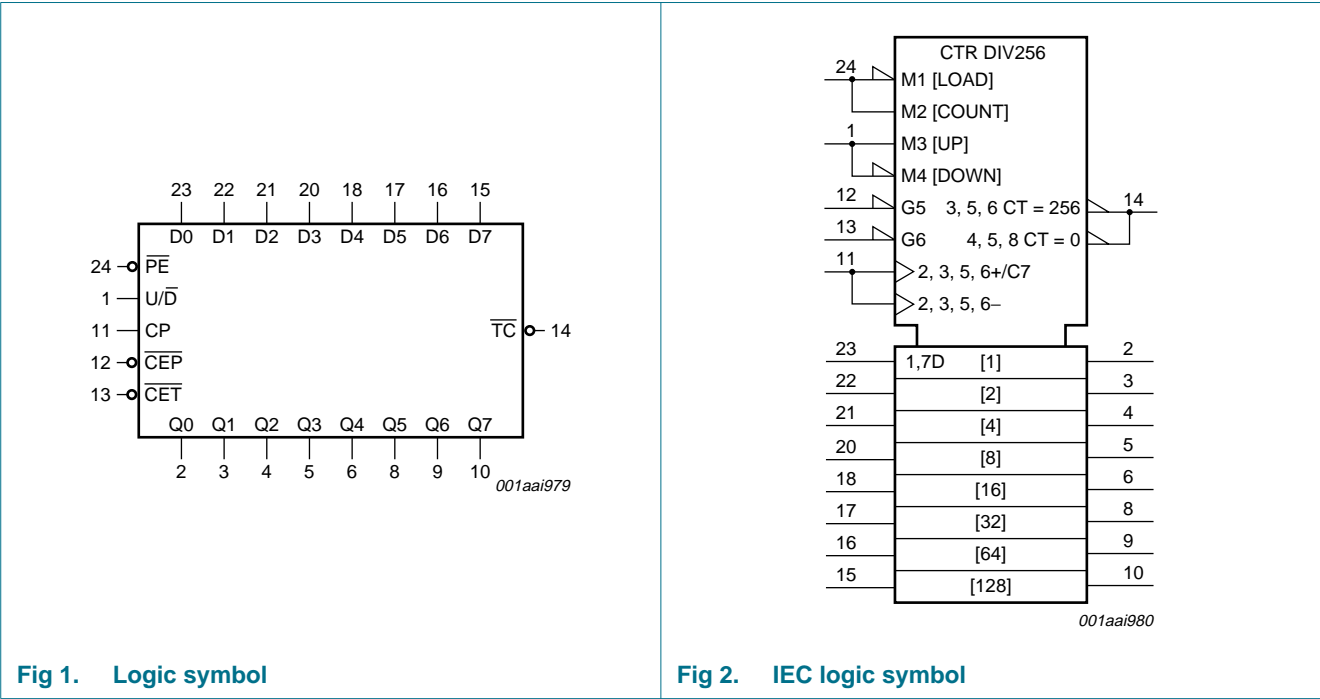
- Synchronous counting and loading
- Built-in look-ahead carry capability
- Count frequency 115 MHz (typical)
- Supply current 95 mA (typical)

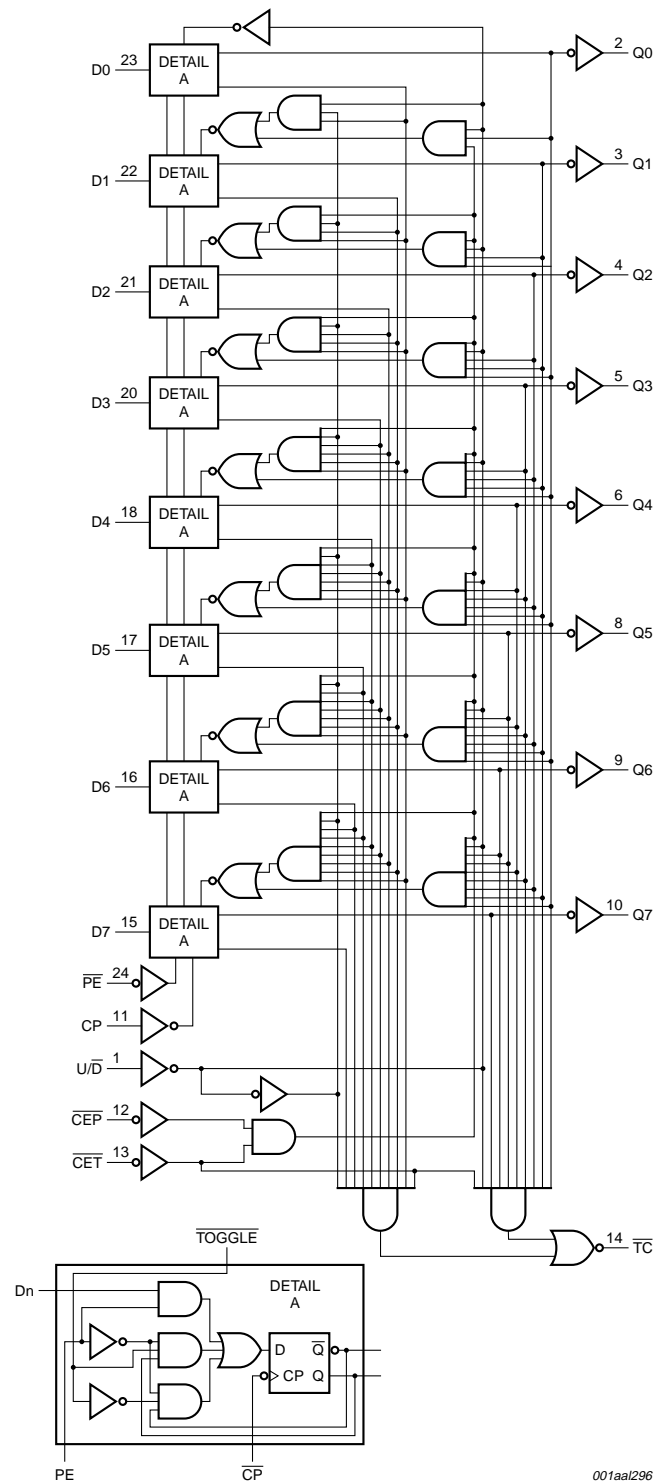
### 3. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
N74F269D	0 °C to 70 °C	SO24	plastic small outline package; 24 leads; body width 7.5 mm	SOT137-1
N74F269DB	0 °C to 70 °C	SSOP24	plastic shrink small outline package; 24 leads; body width 5.3 mm	SOT340-1

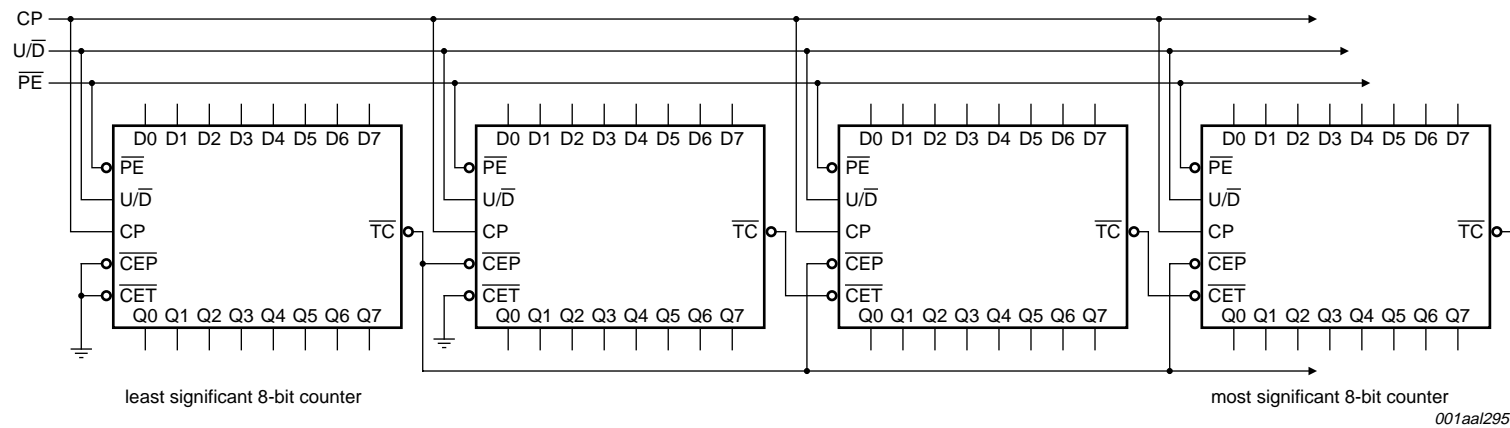
4. Functional diagram





001aal296

Fig 3. Logic diagram



**Fig 4. Synchronous multistage counting scheme**

5. Pinning information

5.1 Pinning

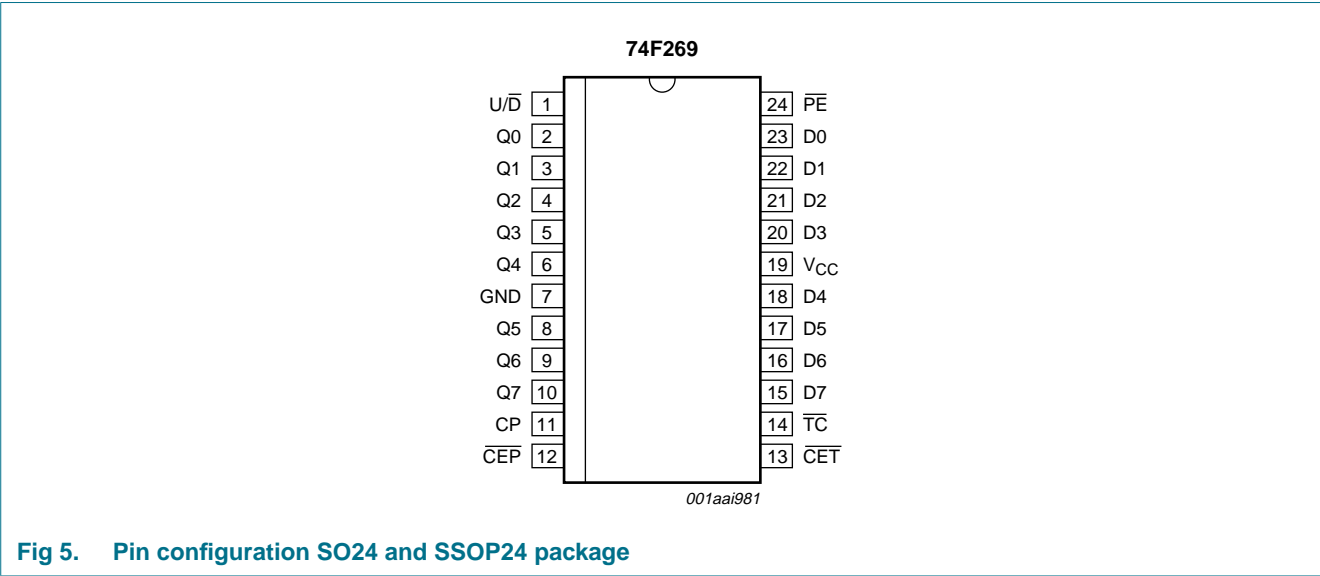


Fig 5. Pin configuration SO24 and SSOP24 package

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description	Unit load HIGH/LOW	Load value <sup>[1]</sup> HIGH/LOW
U/D	1	up or down count control input	1.0/1.0	20 μA/0.6 mA
Q0 to Q7	2, 3, 4, 5, 6, 8, 9, 10	data output	50/33	1.0 mA/20 mA
GND	7	ground (0 V)	-	-
CP	11	clock input	1.0/1.0	20 μA/0.6 mA
CEP	12	count enable parallel input (active LOW)	1.0/1.0	20 μA/0.6 mA
CET	13	count enable trickle input (active LOW)	1.0/1.0	20 μA/0.6 mA
TC	14	terminal count output (active LOW)	50/33	1.0 mA/20 mA
D0 to D7	23, 22, 21, 20, 18, 17, 16, 15	data input	1.0/1.0	20 μA/0.6 mA
VCC	19	supply voltage	-	-
PE	24	parallel enable input (active LOW)	1.0/1.0	20 μA/0.6 mA

[1] One FAST Unit Load (UL) is defined as 20 μA in HIGH state, 0.6 μA in LOW state.

## 6. Functional description

### 6.1 Function table

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

Operating modes	Input						Output	
	CP	U/D	$\overline{\text{CEP}}$	$\overline{\text{CET}}$	$\overline{\text{PE}}$	Dn	Qn	$\overline{\text{TC}}$
Parallel load (Dn to Qn)	↑	X	X	X	l	l	L	*
	↑	X	X	X	l	h	H	*
Count up (increment)	↑	h	l	l	h	X	count up	*
Count down (decrement)	↑	l	l	l	h	X	count down	*
Hold (do nothing)	↑	X	h	l	h	X	qn	*
	↑	X	X	h	h	X	qn	H

[1] H = HIGH voltage level steady state

h = HIGH voltage level one set-up time prior to the LOW-to-HIGH clock transition

L = LOW voltage level steady state

l = LOW voltage level one set-up time prior to the LOW-to-HIGH clock transition

qn = Lower case letters indicate state of referenced output prior to the LOW-to-HIGH clock transition

X = don't care

↑ = LOW-to-HIGH clock transition

\* = The  $\overline{\text{TC}}$  is LOW when  $\overline{\text{CET}}$  is LOW and the counter is at terminal count

Terminal count up is with all Qn outputs HIGH and terminal count down is with all Qn outputs LOW.

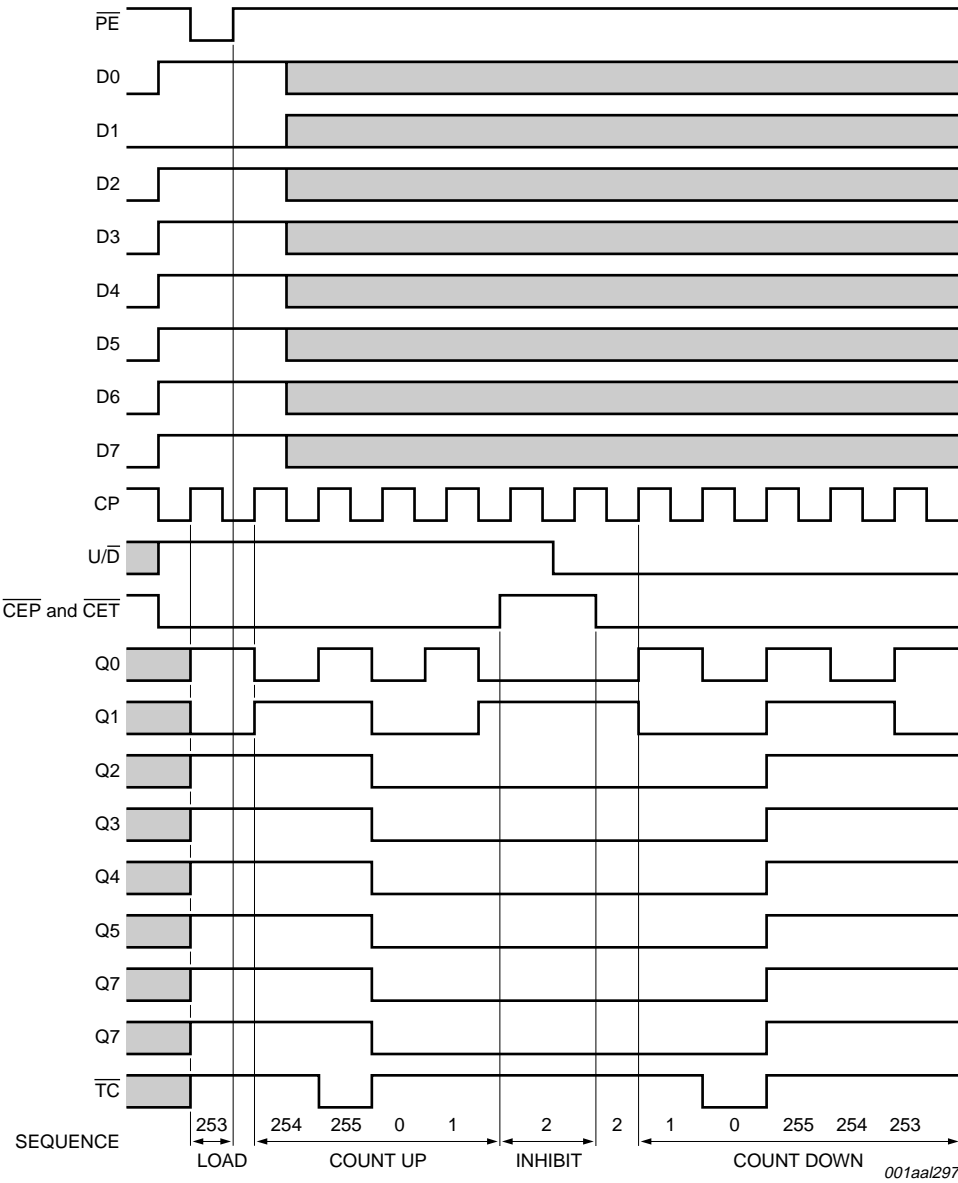


Fig 6. Typical timing sequence

## 7. Limiting values

**Table 4. Limiting values**

*In accordance with the Absolute Maximum Rating System (IEC 60134).*

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		−0.5	+7.0	V
V <sub>I</sub>	input voltage		[1] −0.5	+7.0	V
V <sub>O</sub>	output voltage	output in HIGH-state	[1] −0.5	+5.5	V
I <sub>IK</sub>	input clamping current	V <sub>I</sub> < 0 V	−30	+5	mA
I <sub>O</sub>	output current	output in LOW-state	-	40	mA
T <sub>amb</sub>	ambient temperature	in free air	[2] 0	70	°C
T <sub>stg</sub>	storage temperature		−65	+150	°C

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- [2] The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150 °C.

## 8. Recommended operating conditions

**Table 5. Recommended operating conditions**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>CC</sub>	supply voltage		4.5	5.0	5.5	V
V <sub>IH</sub>	HIGH-level input voltage		2.0	-	-	V
V <sub>IL</sub>	LOW-level input voltage		-	-	0.8	V
I <sub>IK</sub>	input clamping current		-	-	−18	mA
I <sub>OH</sub>	HIGH-level output current		−1	-	-	mA
I <sub>OL</sub>	LOW-level output current		-	-	20	mA



## 9. Static characteristics

**Table 6.** Static characteristics

Symbol	Parameter	Conditions	25 °C; V <sub>CC</sub> = 5.0 V			–40 °C to +85 °C		Unit
			Min	Typ <sup>[1]</sup>	Max	Min	Max	
V <sub>IK</sub>	input clamping voltage	V <sub>CC</sub> = 4.5 V; I <sub>IK</sub> = –18 mA	–1.2	–0.73	–	–1.2	–	V
V <sub>OH</sub>	HIGH-level output voltage	V <sub>CC</sub> = 4.5 V; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>						
		V <sub>CC</sub> = ±10 %; I <sub>OH</sub> = –1 mA	–	–	–	2.5	–	V
		V <sub>CC</sub> = ±5 %; I <sub>OH</sub> = –1 mA	–	3.4	–	2.7	–	V
V <sub>OL</sub>	LOW-level output voltage	V <sub>CC</sub> = 4.5 V; I <sub>OL</sub> = 20 mA; V <sub>I</sub> = V <sub>IL</sub> or V <sub>IH</sub>						
		V <sub>CC</sub> = ±10 %	–	0.30	–	–	0.50	V
		V <sub>CC</sub> = ±5 %	–	0.30	–	–	0.50	V
I <sub>I</sub>	input leakage current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = 7.0 V	–	–	–	–	100	μA
I <sub>IH</sub>	HIGH-level input current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = 2.7 V	–	–	–	–	20	μA
I <sub>IL</sub>	LOW-level input current	V <sub>CC</sub> = 5.5 V; V <sub>I</sub> = 0.5 V	–	–	–	–	–0.6	mA
I <sub>O</sub>	output current	V <sub>CC</sub> = 5.5 V <sup>[2]</sup>	–	–	–	–60	–150	mA
I <sub>CC</sub>	supply current	PE = CET = CEP = U/D = GND; V <sub>CC</sub> = 5.5 V; CP = rising edge						
		Dn: V <sub>I</sub> = 4.5 V	–	93	–	–	120	mA
		Dn: V <sub>I</sub> = GND	–	98	–	–	125	mA

[1] All typical values are measured at V<sub>CC</sub> = 5 V.

[2] Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

## 10. Dynamic characteristics

**Table 7.** Dynamic characteristics

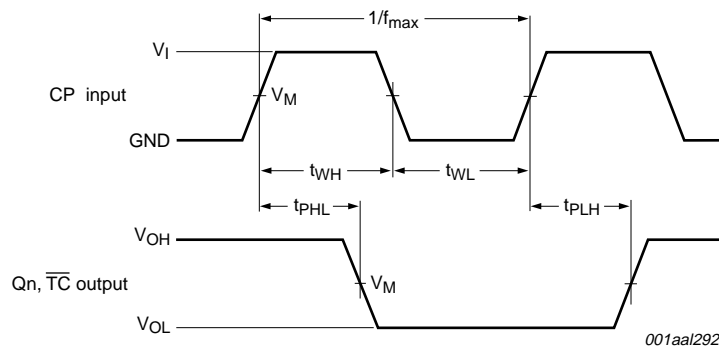
GND = 0 V; for test circuit, see [Figure 13](#).

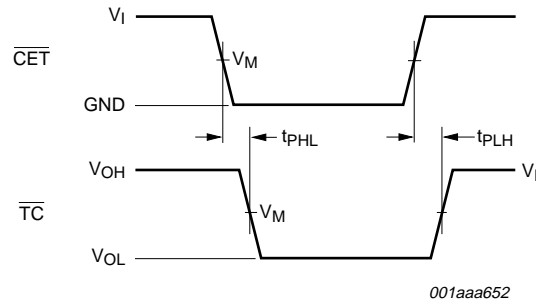
Symbol	Parameter	Conditions	25 °C; V <sub>CC</sub> = 5.0 V			0 °C to 70 °C; V <sub>CC</sub> = 5.0 V ± 0.5 V		Unit
			Min	Typ	Max	Min	Max	
t <sub>PLH</sub>	LOW to HIGH propagation delay	CP to Qn; load; PE = LOW; see <a href="#">Figure 7</a>	3.0	6.0	8.5	3.0	9.0	ns
		CP to Qn; count; PE = HIGH; see <a href="#">Figure 7</a>	3.0	6.0	9.0	3.0	10.0	ns
		CP to TC; see <a href="#">Figure 7</a>	4.5	6.5	9.5	4.0	10.5	ns
		CET to TC; see <a href="#">Figure 8</a>	3.5	6.0	9.0	3.0	10.0	ns
		U/D to TC; see <a href="#">Figure 9</a>	4.5	7.0	9.0	4.0	10.0	ns
t <sub>PHL</sub>	HIGH to LOW propagation delay	CP to Qn; load; PE = LOW; see <a href="#">Figure 7</a>	4.0	6.5	8.5	4.0	9.0	ns
		CP to Qn; count; PE = HIGH; see <a href="#">Figure 7</a>	4.5	7.0	10.0	4.0	10.5	ns
		CP to TC; see <a href="#">Figure 7</a>	5.0	6.5	9.5	5.0	10.0	ns
		CET to TC; see <a href="#">Figure 8</a>	3.0	6.5	9.0	3.0	10.0	ns
		U/D to TC; see <a href="#">Figure 9</a>	4.5	7.0	9.5	4.0	10.0	ns

**Table 7. Dynamic characteristics ...continued**GND = 0 V; for test circuit, see [Figure 13](#).

Symbol	Parameter	Conditions	25 °C; V <sub>CC</sub> = 5.0 V			0 °C to 70 °C; V <sub>CC</sub> = 5.0 V ± 0.5 V		Unit
			Min	Typ	Max	Min	Max	
t <sub>su(H)</sub>	set-up time HIGH	Dn to CP; see <a href="#">Figure 10</a>	3.5	-	-	2.5	-	ns
		$\overline{PE}$ to CP; see <a href="#">Figure 10</a>	5.5	-	-	5.5	-	ns
		$\overline{CEP}$ or $\overline{CET}$ to CP; see <a href="#">Figure 11</a>	6.0	-	-	5.0	-	ns
		U/ $\overline{D}$ to CP; see <a href="#">Figure 12</a>	8.0	-	-	6.5	-	ns
t <sub>su(L)</sub>	set-up time LOW	Dn to CP; see <a href="#">Figure 10</a>	3.5	-	-	2.5	-	ns
		$\overline{PE}$ to CP; see <a href="#">Figure 10</a>	6.5	-	-	6.5	-	ns
		$\overline{CEP}$ or $\overline{CET}$ to CP; see <a href="#">Figure 11</a>	8.0	-	-	6.5	-	ns
		U/ $\overline{D}$ to CP; see <a href="#">Figure 12</a>	6.5	-	-	6.5	-	ns
t <sub>h(H)</sub>	hold time HIGH	Dn to CP; see <a href="#">Figure 10</a>	1.0	-	-	0	-	ns
		$\overline{PE}$ to CP; see <a href="#">Figure 10</a>	0	-	-	0	-	ns
		$\overline{CEP}$ or $\overline{CET}$ to CP; see <a href="#">Figure 11</a>	0	-	-	0	-	ns
		U/ $\overline{D}$ to CP; see <a href="#">Figure 12</a>	0	-	-	0	-	ns
t <sub>h(L)</sub>	hold time LOW	Dn to CP; see <a href="#">Figure 10</a>	1.0	-	-	1.0	-	ns
		$\overline{PE}$ to CP; see <a href="#">Figure 10</a>	0	-	-	0	-	ns
		$\overline{CEP}$ or $\overline{CET}$ to CP; see <a href="#">Figure 11</a>	0	-	-	0	-	ns
		U/ $\overline{D}$ to CP; see <a href="#">Figure 12</a>	0	-	-	0	-	ns
t <sub>WH</sub>	pulse width HIGH	CP; see <a href="#">Figure 7</a>	4.0	-	-	4.0	-	ns
t <sub>WL</sub>	pulse width LOW	CP; see <a href="#">Figure 7</a>	4.5	-	-	5.0	-	ns
f <sub>max</sub>	maximum frequency	see <a href="#">Figure 7</a>	100	115	-	85	-	MHz

## 11. Waveforms

Measurement points are given in [Table 8](#).V<sub>M</sub> = 1.5 VV<sub>OL</sub> and V<sub>OH</sub> are the typical output voltage levels that occur with the output load.**Fig 7. Clock (CP) to outputs (Qn,  $\overline{TC}$ ) propagation delay, the clock pulse width**

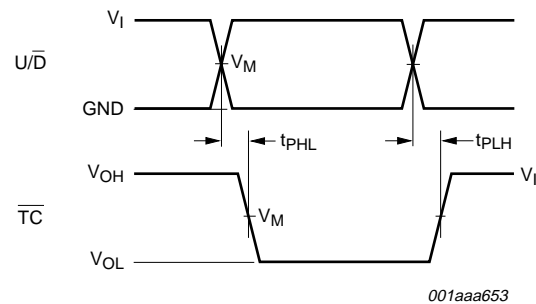


Measurement points are given in [Table 8](#).

$V_M = 1.5 \text{ V}$

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

**Fig 8. Input ( $\overline{\text{CET}}$ ) to output ( $\overline{\text{TC}}$ ) propagation delay**

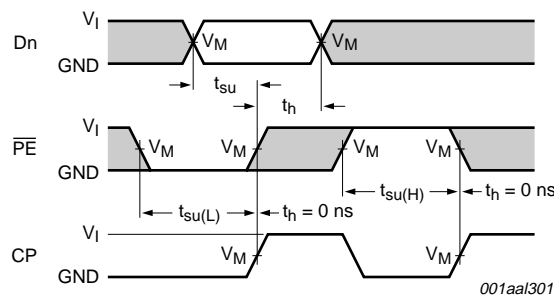


Measurement points are given in [Table 8](#).

$V_M = 1.5 \text{ V}$

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

**Fig 9. The up/down control input ( $\text{U}/\overline{\text{D}}$ ) to output ( $\overline{\text{TC}}$ ) propagation delay**

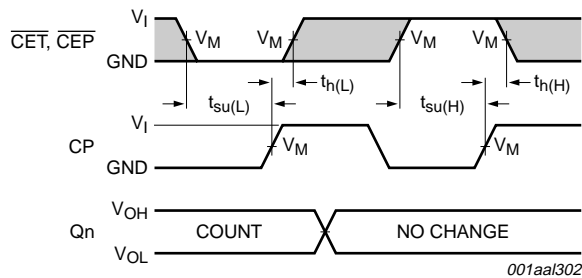


The shaded areas indicate when the input is permitted to change for predictable output performance.

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

$V_M = 1.5 \text{ V}$

**Fig 10. Data input ( $\text{Dn}$ ), parallel enable input ( $\overline{\text{PE}}$ ) and clock input ( $\text{CP}$ ) set-up and hold times**



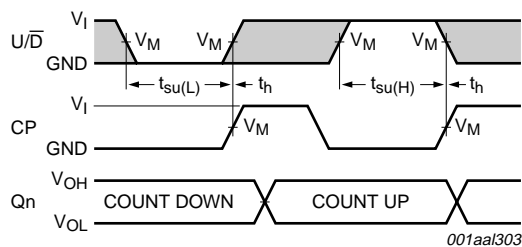
The shaded areas indicate when the input is permitted to change for predictable output performance.

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

$V_M = 1.5 \text{ V}$

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

**Fig 11. Count enable inputs ( $\overline{\text{CEP}}$  and  $\overline{\text{CET}}$ ) and clock input (CP) set-up and hold times**



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

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

$V_M = 1.5 \text{ V}$

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

**Fig 12. Up/down count control input ( $\text{U}/\overline{\text{D}}$ ) and clock input (CP) set-up and hold times**

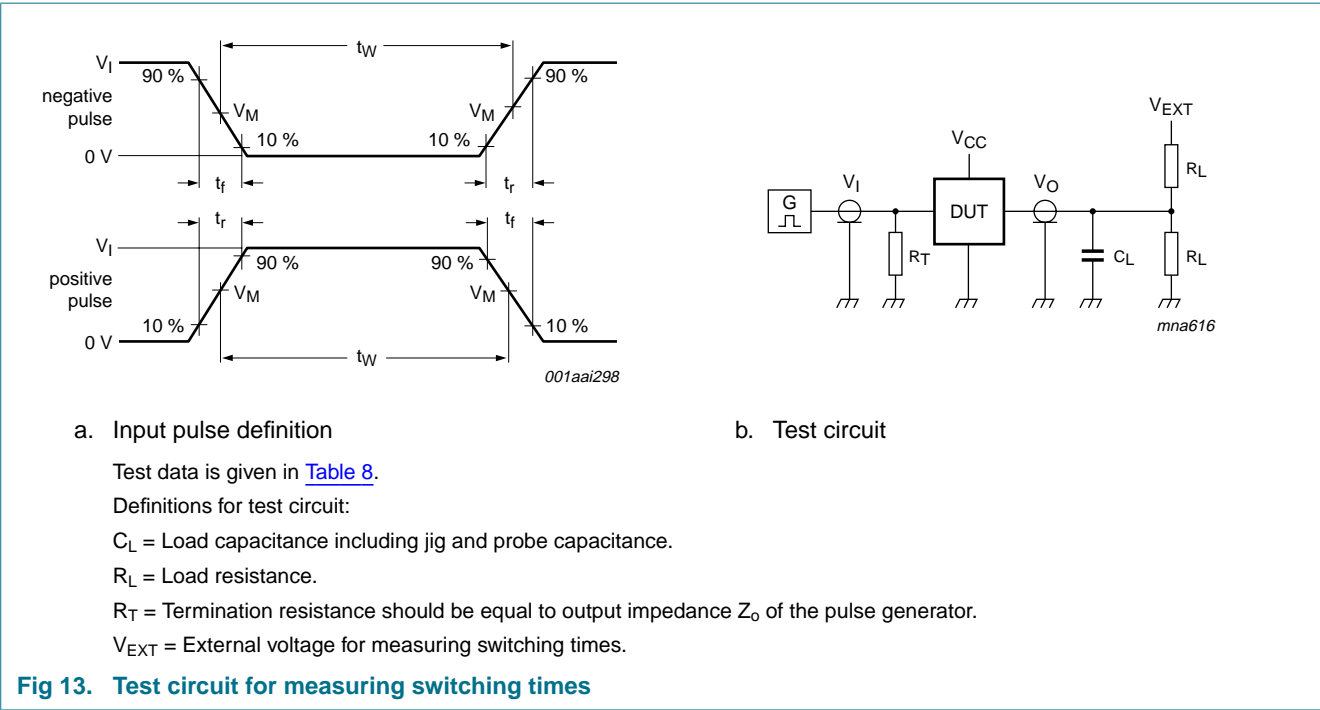


Table 8. Test data

Input				Load		$V_{EXT}$		
$V_I$	$f_I$	$t_W$	$t_r, t_f$	$C_L$	$R_L$	$t_{PHL}, t_{PLH}$	$t_{PZH}, t_{PHZ}$	$t_{PZL}, t_{PLZ}$
3.0 V	1 MHz	500 ns	$\leq 2.5$ ns	50 pF	500 $\Omega$	open	open	7.0 V

12. Package outline

SO24: plastic small outline package; 24 leads; body width 7.5 mm

SOT137-1

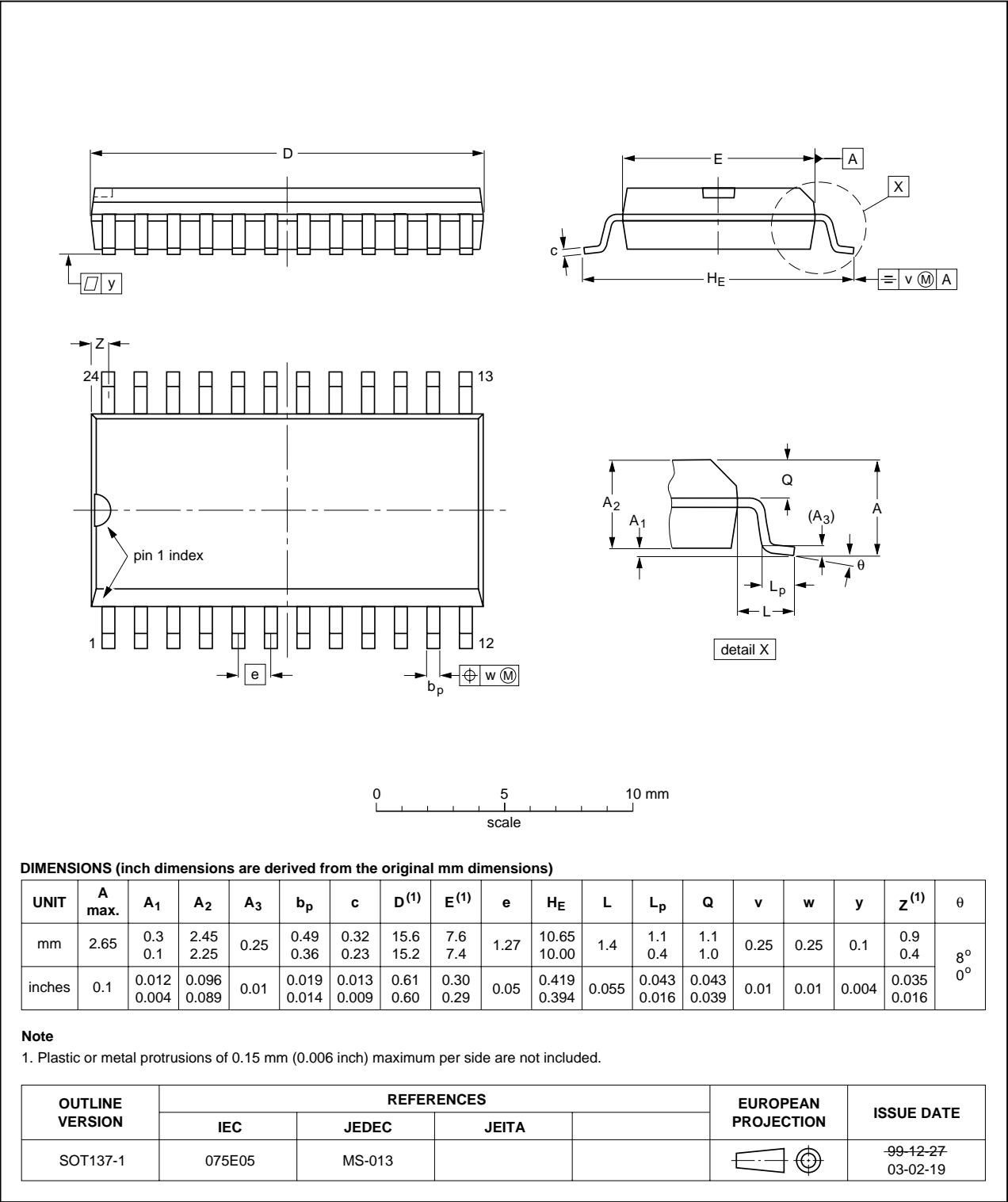


Fig 14. Package outline SOT137-1 (SO24)

SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm

SOT340-1

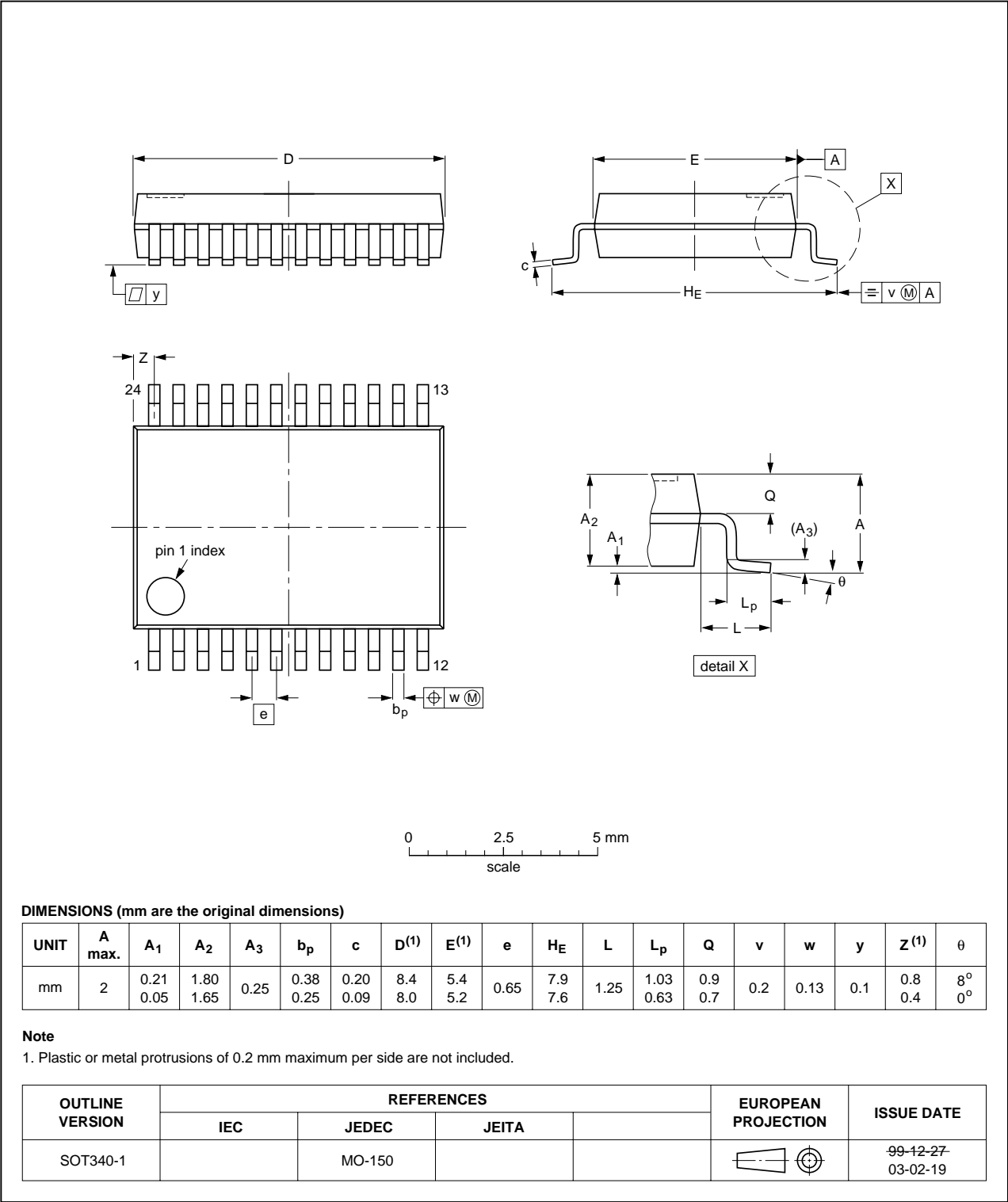


Fig 15. Package outline SOT340-1 (SSOP24)

## 13. Abbreviations

Table 9. Abbreviations

Acronym	Description
BiCMOS	Bipolar Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
HBM	Human Body Model
MM	Machine Model

## 14. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74F269_3	20100126	Product data sheet	-	74F269_2
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>• DIP 24 (SOT222-1) package removed from <a href="#">Section 3 “Ordering information”</a> and <a href="#">Section 12 “Package outline”</a></li></ul>			
74F269_2	19960105	Product specification	-	74F269_1



## 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.nxp.com>.

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