74F269

8-bit bidirectional binary counter Rev. 6 — 14 December 2011

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/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.

Features and benefits 2.

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

Ordering information 3.

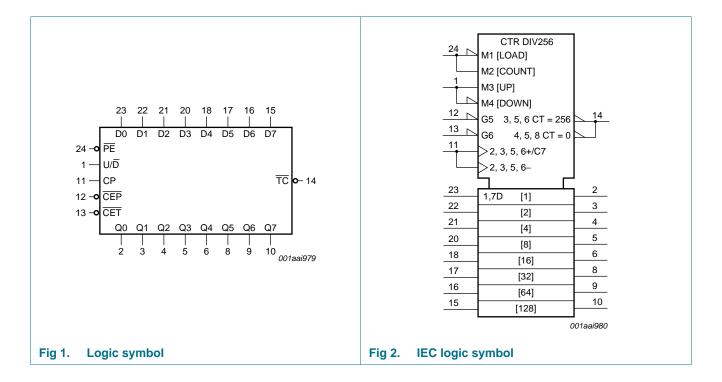
Table 1. **Ordering information**

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

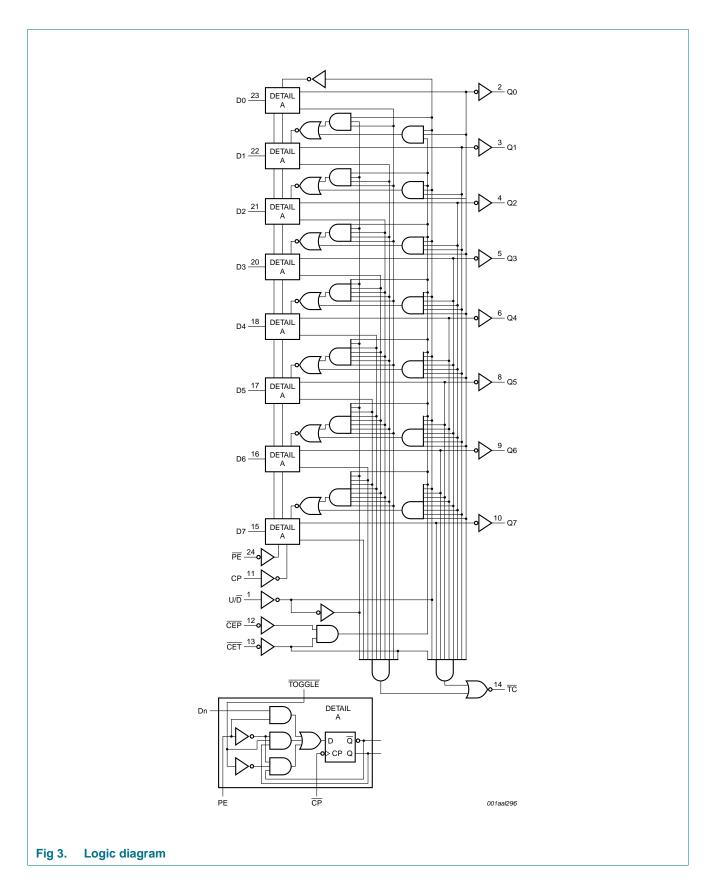


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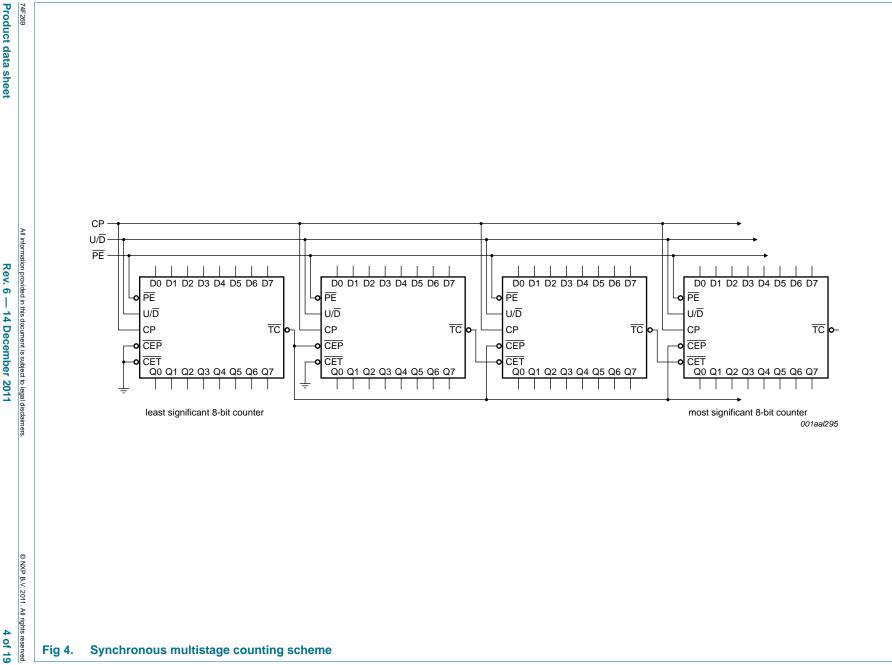
4. Functional diagram



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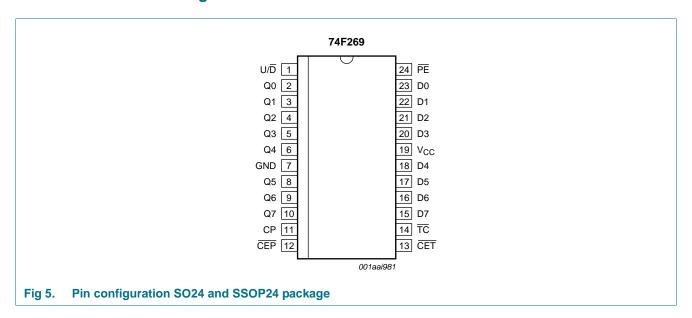
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5. Pinning information

5.1 Pinning



5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description	Unit load HIGH/LOW	Load value ^[1] HIGH/LOW
U/D	1	up or down count control input	1.0/1.0	$20~\mu\text{A}/0.6~\text{mA}$
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)	-	-
СР	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
V_{CC}	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.

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6. Functional description

6.1 Function table

Table 3. Function table[1]

Operating modes	Input						Output	Output	
	СР	U/D	CEP	CET	PE	Dn	Qn	TC	
Parallel load (Dn to Qn)	↑	X	Χ	Χ	I	I	L	*	
	\uparrow	Χ	Χ	Χ	I	h	Н	*	
Count up (increment)	\uparrow	h	I		h	Χ	count up	*	
Count down (decrement)	↑	I	I	I	h	Χ	count down	*	
Hold (do nothing)	↑	Χ	h	I	h	Χ	qn	*	
	\uparrow	Χ	Χ	h	h	Χ	qn	Н	

^[1] H = HIGH voltage level steady state

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

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

L = LOW voltage level steady state

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

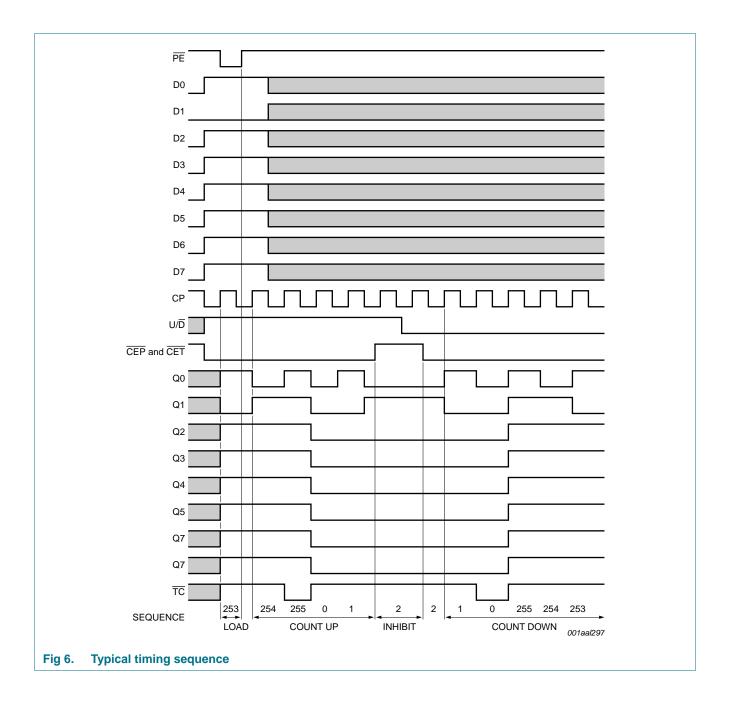
qn = Lower case letters indicate state of referenced output prior to the LOW-to-HIGH clock transition

X = don't care

^{↑ =} LOW-to-HIGH clock transition

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

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7. Limiting values

Table 4. Limiting values

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

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

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

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Тур	Max	Unit
V_{CC}	supply voltage		4.5	5.0	5.5	V
V_{IH}	HIGH-level input voltage		2.0	-	-	V
V _{IL}	LOW-level input voltage		-	-	0.8	V
I _{IK}	input clamping current		-	-	-18	mA
I _{OH}	HIGH-level output current		-1	-	-	mA
I _{OL}	LOW-level output current		-	-	20	mA

^[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.

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9. Static characteristics

Table 6. Static characteristics

Symbol	Parameter	Conditions			25 °C		-40 °C t	o +85 °C	Unit
				Min	Typ[1]	Max	Min	Max	
V_{IK}	input clamping voltage	$V_{CC} = 4.5 \text{ V}; I_{IK} = -18 \text{ mA}$	•	-1.2	-0.73	-	-1.2	-	V
V _{OH}	HIGH-level output	V_{CC} = 4.5 V; V_I = V_{IL} or V_{IH}							
	voltage	$V_{CC} = \pm 10 \%; I_{OH} = -1 \text{ mA}$		-	-	-	2.5	-	V
		$V_{CC} = \pm 5 \%; I_{OH} = -1 \text{ mA}$		-	3.4	-	2.7	-	V
V_{OL}	LOW-level output voltage	V_{CC} = 4.5 V; I_{OL} = 20 mA; V_I = V_{IL} or V_{IH}							
		V _{CC} = ±10 %		-	0.30	-	-	0.50	V
		V _{CC} = ±5 %		-	0.30	-	-	0.50	V
l _l	input leakage current	$V_{CC} = 5.5 \text{ V}; V_I = 7.0 \text{ V}$		-	-	-	-	100	μΑ
I _{IH}	HIGH-level input current	$V_{CC} = 5.5 \text{ V}; V_I = 2.7 \text{ V}$		-	-	-	-	20	μΑ
I _{IL}	LOW-level input current	$V_{CC} = 5.5 \text{ V}; V_I = 0.5 \text{ V}$		-	-	-	-	-0.6	mΑ
Io	output current	V _{CC} = 5.5 V	[2]	-	-	-	-60	-150	mΑ
I _{CC}	supply current	$\overline{PE} = \overline{CET} = \overline{CEP} = U/\overline{D} = GND;$ $V_{CC} = 5.5 \text{ V}; CP = \text{rising edge}$							
		Dn: V _I = 4.5 V		-	93	-	-	120	mΑ
		Dn: V _I = GND		-	98	-	-	125	mΑ

^[1] All typical values are measured at V_{CC} = 5 V.

10. Dynamic characteristics

Table 7. Dynamic characteristics GND = 0 *V; for test circuit, see Figure 13.*

Symbol	Parameter	Conditions	25 °C;	; V _{CC} =	5.0 V	0 °C to V _{CC} = 5.0	70 °C; V ± 0.5 V	Unit
			Min	Тур	Max	Min	Max	
t_{PLH}	LOW to HIGH	CP to Qn; load; $\overline{PE} = LOW$; see $\underline{Figure 7}$	3.0	6.0	8.5	3.0	9.0	ns
	propagation delay	CP to Qn; count; PE = HIGH; see Figure 7	3.0	6.0	9.0	3.0	10.0	ns
		CP to TC; see Figure 7	4.5	6.5	9.5	4.0	10.5	ns
		CET to TC; see Figure 8	3.5	6.0	9.0	3.0	10.0	ns
		U/D to TC; see Figure 9	4.5	7.0	9.0	4.0	10.0	ns
t _{PHL}	HIGH to LOW	CP to Qn; load; $\overline{PE} = LOW$; see $\underline{Figure 7}$	4.0	6.5	8.5	4.0	9.0	ns
	propagation delay	CP to Qn; count; PE = HIGH; see Figure 7	4.5	7.0	10.0	4.0	10.5	ns
		CP to TC; see Figure 7	5.0	6.5	9.5	5.0	10.0	ns
		CET to TC; see Figure 8	3.0	6.5	9.0	3.0	10.0	ns
		U/D to TC; see Figure 9	4.5	7.0	9.5	4.0	10.0	ns

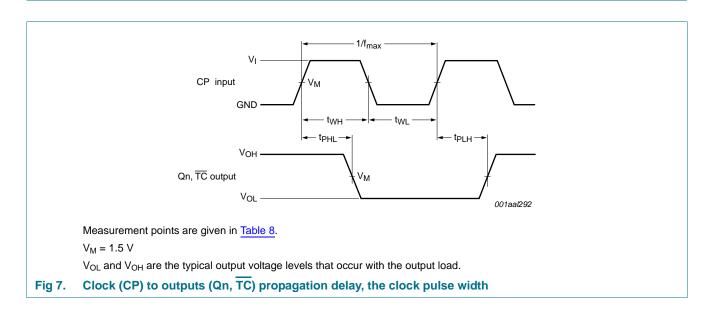
^[2] Not more than one output should be tested at a time, and the duration of the test should not exceed one second.

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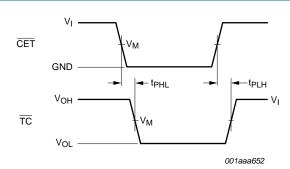
Table 7. Dynamic characteristics ...continued GND = 0 V; for test circuit, see <u>Figure 13</u>.

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

11. Waveforms



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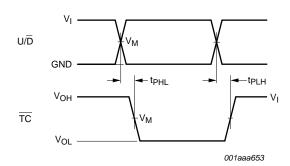


Measurement points are given in Table 8.

 $V_{M} = 1.5 V$

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

Fig 8. Input (CET) to output (TC) propagation delay

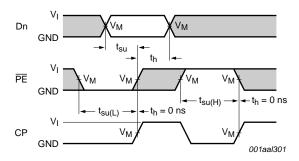


Measurement points are given in Table 8.

 $V_M = 1.5 V$

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

Fig 9. The up/down control input (U/D) to output (TC) propagation delay



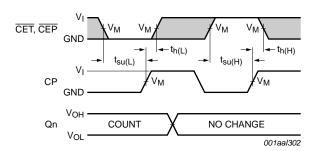
The shaded areas indicate when the input is permitted to change for predictable output performance.

Measurement points are given in Table 8.

 $V_{M} = 1.5 V$

Fig 10. Data input (Dn), parallel enable input (PE) and clock input (CP) set-up and hold times

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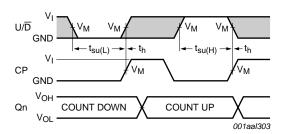
The shaded areas indicate when the input is permitted to change for predictable output performance.

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 (CEP and 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.

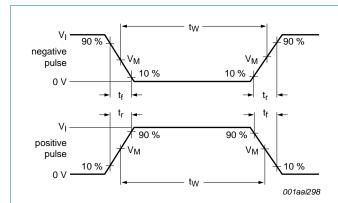
Measurement points are given in Table 8.

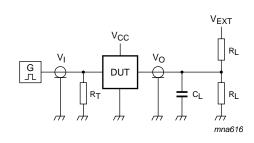
 $V_M = 1.5 V$

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

Fig 12. Up/down count control input (U/D) and clock input (CP) set-up and hold times

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b. Test circuit

a. Input pulse definition

Test data is given in Table 8.

Definitions for test circuit:

C_L = Load capacitance including jig and probe capacitance.

R_L = Load resistance.

 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. Test circuit for measuring switching times

Table 8. Test data

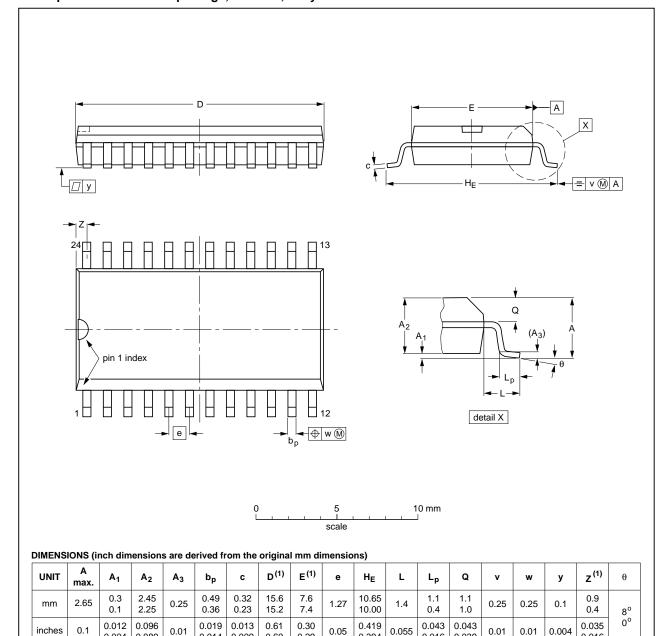
Input	Input					V _{EXT}			
V_{I}	f_{l} t_{W} t_{r} , t_{f}		t _r , t _f	CL	R_L	t _{PHL} , t _{PLH}	t _{PZH} , t _{PHZ}	t _{PZL} , t _{PLZ}	
3.0 V	1 MHz	500 ns	≤ 2.5 ns	50 pF	500Ω	open	open	7.0 V	

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12. Package outline

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

SOT137-1



Note

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

0.014

0.009

OUTLINE		REFER	EUROPEAN	ISSUE DATE	
VERSION	IEC	JEDEC	JEITA	PROJECTION	ISSUE DATE
SOT137-1	075E05	MS-013			99-12-27 03-02-19

0.394

0.016

Fig 14. Package outline SOT137-1 (SO24)

0.004

0.089

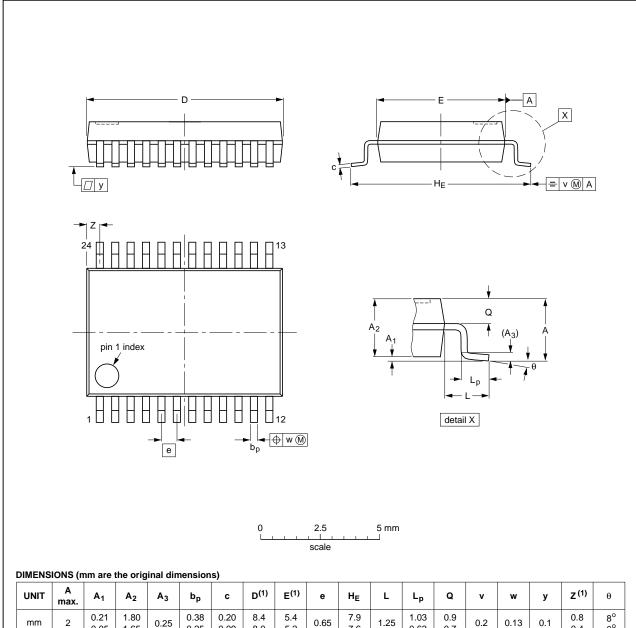
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SSOP24: plastic shrink small outline package; 24 leads; body width 5.3 mm

SOT340-1



UNIT	A max.	A ₁	A ₂	A ₃	bp	C	D ⁽¹⁾	E ⁽¹⁾	e	HE	L	Lp	Q	٧	w	у	Z ⁽¹⁾	θ
mm	2	0.21 0.05	1.80 1.65	0.25	0.38 0.25	0.20 0.09	8.4 8.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	0.8 0.4	8° 0°

Note

1. Plastic or metal protrusions of 0.2 mm maximum per side are not included.

OUTLINE		REFER	ENCES	EUROPEAN	ISSUE DATE
VERSION	IEC	JEDEC	JEITA	PROJECTION	ISSUE DATE
SOT340-1		MO-150			99-12-27 03-02-19

Fig 15. Package outline SOT340-1 (SSOP24)

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13. Abbreviations

Table 9. Abbreviations

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

14. Revision history

Table 10. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
74F269 v.6	20111214	Product data sheet	-	74F269 v.5
Modifications:	Legal pages updated.			
74F269 v.5	20100325	Product data sheet	-	74F269 v.4
74F269 v.4	20100308	Product data sheet	-	74F269 v.3
74F269 v.3	20100126	Product data sheet	-	74F269 v.2
74F269 v.2	19960105	Product specification	-	74F269 v.1

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15. Legal information

15.1 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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