

DATA SHEET

74LVC27

Triple 3-input NOR gate

Product specification
Supersedes data of 1998 Apr 28

2004 Jan 13

Triple 3-input NOR gate

74LVC27

FEATURES

- Wide supply voltage range from 1.2 to 3.6 V
- Inputs accept voltages up to 5.5 V
- CMOS low power consumption
- Direct interface with TTL levels
- Output capability: standard
- Complies with JEDEC standard no. 8-1A
- ESD protection:
HBM EIA/JESD22-A114-A exceeds 2000 V
MM EIA/JESD22-A115-A exceeds 200 V.
- I_{CC} category: SSI.

DESCRIPTION

The 74LVC27 is a high-performance, low power, low-voltage, Si-gate CMOS device and superior to most advanced CMOS compatible TTL families.

The 74LVC27 provides the 3-input NOR function.

QUICK REFERENCE DATA

GND = 0 V; $T_{amb} = 25\text{ }^{\circ}\text{C}$; $t_r = t_f \leq 2.5\text{ ns}$.

SYMBOL	PARAMETER	CONDITIONS	TYPICAL	UNIT
t_{PHL}/t_{PLH}	propagation delay nA, nB, nC to nY	$C_L = 50\text{ pF}$; $V_{CC} = 3.3\text{ V}$	3.4	ns
C_I	input capacitance		5.0	pF
C_{PD}	power dissipation capacitance per gate	notes 1 and 2	26	pF

Notes

1. C_{PD} is used to determine the dynamic power dissipation (P_D in μW).

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

f_i = input frequency in MHz;

f_o = output frequency in MHz;

C_L = output load capacitance in pF;

V_{CC} = supply voltage in Volts;

N = total load switching outputs;

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

2. The condition is $V_I = \text{GND to } V_{CC}$.

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FUNCTION TABLE

See note 1.

INPUT			OUTPUT
nA	nB	nC	nY
L	L	L	H
X	X	H	L
X	H	X	L
H	X	X	L

Note

1. H = HIGH voltage level;
L = LOW voltage level;
X = don't care.

ORDERING INFORMATION

TYPE NUMBER	PACKAGE				
	TEMPERATURE RANGE	PINS	PACKAGE	MATERIAL	CODE
74LVC27D	-40 to +85 °C	14	SO14	plastic	SOT108-1
74LVC27DB	-40 to +85 °C	14	SSOP14	plastic	SOT337-1
74LVC27PW	-40 to +85 °C	14	TSSOP14	plastic	SOT402-1
74LVC27BQ	-40 to +85 °C	14	DHVQFN14	plastic	SOT762-1

PINNING

PIN	SYMBOL	DESCRIPTION
1	1A	data input
2	1B	data input
3	2A	data input
4	2B	data input
5	2C	data input
6	2Y	data output
7	GND	ground (0 V)
8	3Y	data output
9	3A	data input
10	3B	data input
11	2C	data input
12	1Y	data output
13	1C	data input
14	V _{CC}	supply voltage

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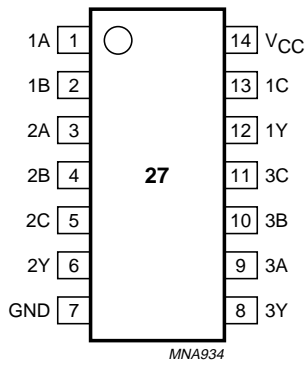
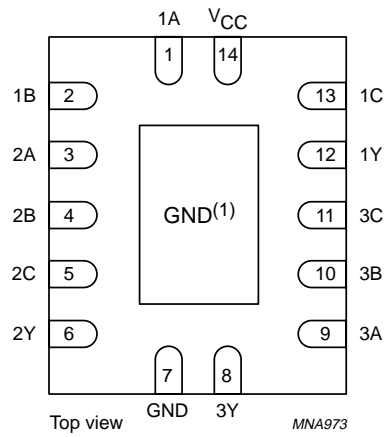


Fig.1 Pin configuration SO14 and (T)SSOP14.



(1) The die substrate is attached to this pad using conductive die attach material. It can not be used as a supply pin or input.

Fig.2 Pin configuration DHVQFN14.

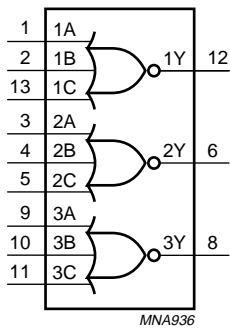


Fig.3 Logic symbol.

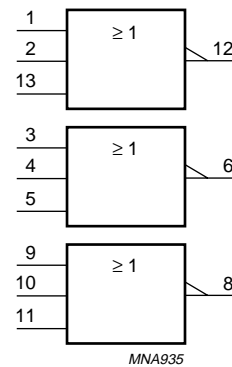


Fig.4 Logic symbol (IEEE/IEC).

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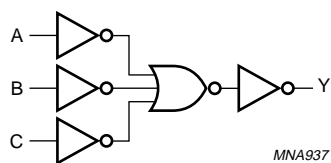


Fig.5 Logic diagram (one gate).

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RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	CONDITIONS	MIN.	MAX.	UNIT
V_{CC}	supply voltage	for maximum speed performance	2.7	3.6	V
		for low-voltage applications	1.2	3.6	V
V_I	input voltage		0	5.5	V
V_O	output voltage		0	V_{CC}	V
T_{amb}	operating ambient temperature	in free air	-40	+85	°C
t_r, t_f	input rise and fall times	$V_{CC} = 1.2$ to 2.7 V	0	20	ns/V
		$V_{CC} = 2.7$ to 3.6 V	0	10	ns/V

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 diode current	$V_I < 0$	-	-50	mA
V_I	input voltage	note 1	-0.5	+5.5	V
I_{OK}	output diode current	$V_O > V_{CC}$ or $V_O < 0$	-	± 50	mA
V_O	output voltage	note 1	-0.5	$V_{CC} + 0.5$	V
I_O	output source or sink current	$V_O = 0$ to V_{CC}	-	± 50	mA
I_{CC}, I_{GND}	V_{CC} or GND current		-	± 100	mA
T_{stg}	storage temperature		-60	+150	°C
P_{tot}	power dissipation per package	$T_{amb} = -40$ to $+85$ °C; note 2	-	500	mW

Notes

- The input and output voltage ratings may be exceeded if the input and output current ratings are observed.
- For SO14 packages: above 70 °C derate linearly with 8 mW/K.
For SSOP14 and TSSOP14 packages: above 60 °C derate linearly with 5.5 mW/K.
For DHVQFN14 packages: above 60 °C derate linearly with 4.5 mW/K.

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DC CHARACTERISTICS

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. ⁽¹⁾	MAX.	UNIT		
		OTHER	V _{CC} (V)						
T_{amb} = -40 to +85 °C									
V _{IH}	HIGH-level input voltage		1.2	V _{CC}	–	–	V		
			2.7 to 3.6	2.0	–	–	V		
V _{IL}	LOW-level input voltage		1.2	–	–	GND	V		
			2.7 to 3.6	–	–	0.8	V		
V _{OH}	HIGH-level output voltage	V _I = V _{IH} or V _{IL}	2.7	V _{CC} – 0.5	–	–	V		
		I _O = –12 mA	3.0	V _{CC} – 0.2	V _{CC}	–	V		
		I _O = –100 µA	3.0	V _{CC} – 0.6	–	–	V		
		I _O = –24 mA	3.0	V _{CC} – 1.0	–	–	V		
V _{OL}	LOW-level output voltage	V _I = V _{IH} or V _{IL}	2.7	–	–	0.40	V		
		I _O = 12 mA	3.0	–	GND	0.20	V		
		I _O = 100 µA	3.0	–	–	0.55	V		
I _{LI}	input leakage current	V _I = 5.5 V or GND	3.6	–	±0.1	±5	µA		
		I _{CC}	quiescent supply current	V _I = V _{CC} or GND; I _O = 0	3.6	–	0.1	10	µA
		ΔI _{CC}	additional quiescent supply current per input pin	V _I = V _{CC} – 0.6 V; I _O = 0	2.7 to 3.6	–	5	500	µA

Note

- All typical values are measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.

AC CHARACTERISTICSGND = 0 V; t_r = t_f ≤ 2.5 ns; C_L = 50 pF; R_L = 500 Ω.

SYMBOL	PARAMETER	TEST CONDITIONS		MIN.	TYP. ⁽¹⁾	MAX.	UNIT.
		WAVEFORM	V _{CC} (V)				
T_{amb} = -40 to +85 °C							
t _{PHL} /t _{PLH}	propagation delay nA, nB, nC to nY	see Figs 6 and 7	3.0 to 3.6	–	3.4	5.9	ns
			2.7	–	–	7.0	ns

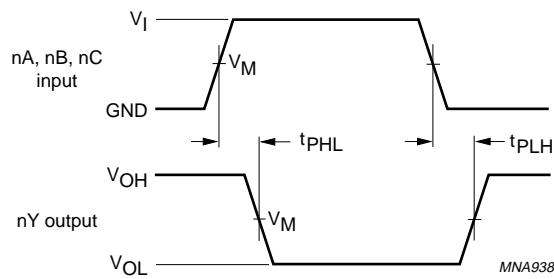
Note

- The typical value is measured at V_{CC} = 3.3 V and T_{amb} = 25 °C.

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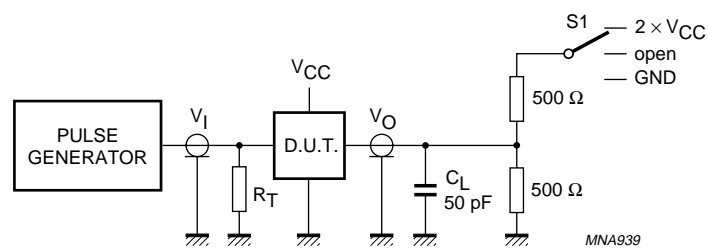
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AC WAVEFORMS



$V_M = 1.5\text{ V}$ at $V_{CC} \geq 2.7\text{ V}$.
 $V_M = 0.5V_{CC}$ at $V_{CC} < 2.7\text{ V}$.
 V_{OL} and V_{OH} are the typical output voltage drop that occur with the output load.

Fig.6 Input (nA, nB and nC) to output (nY) propagation delays.



TEST	S1
t_{PLH}/t_{PHL}	open

V_{CC}	V_I
<2.7 V	V_{CC}
2.7 to 3.6 V	2.7 V

Definitions for test circuits:
 C_L = Load capacitance including jig and probe capacitance.
 R_T = Termination resistance should be equal to the output impedance Z_o of the pulse generator.

Fig.7 Load circuitry for switching times.

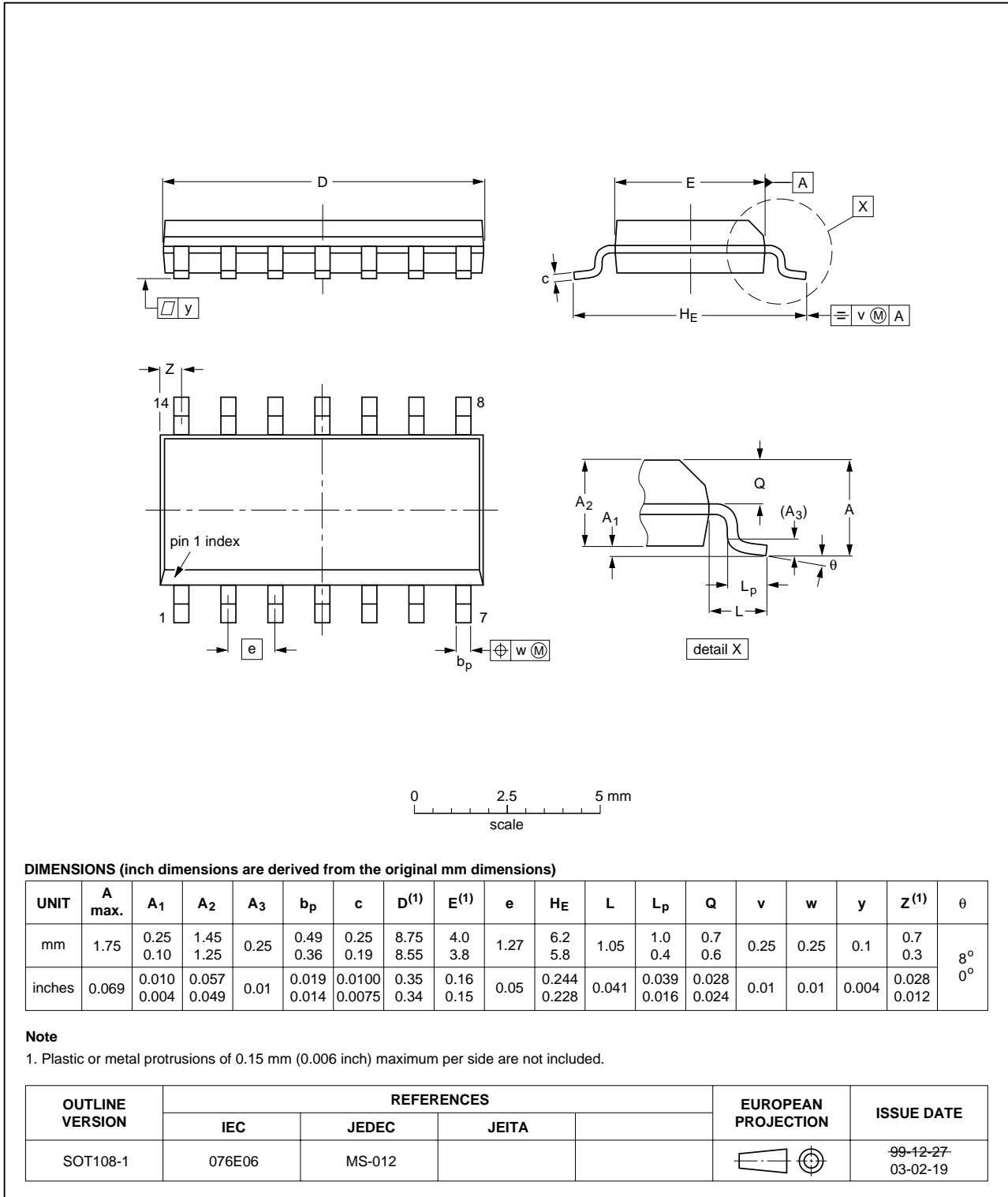
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PACKAGE OUTLINES

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1

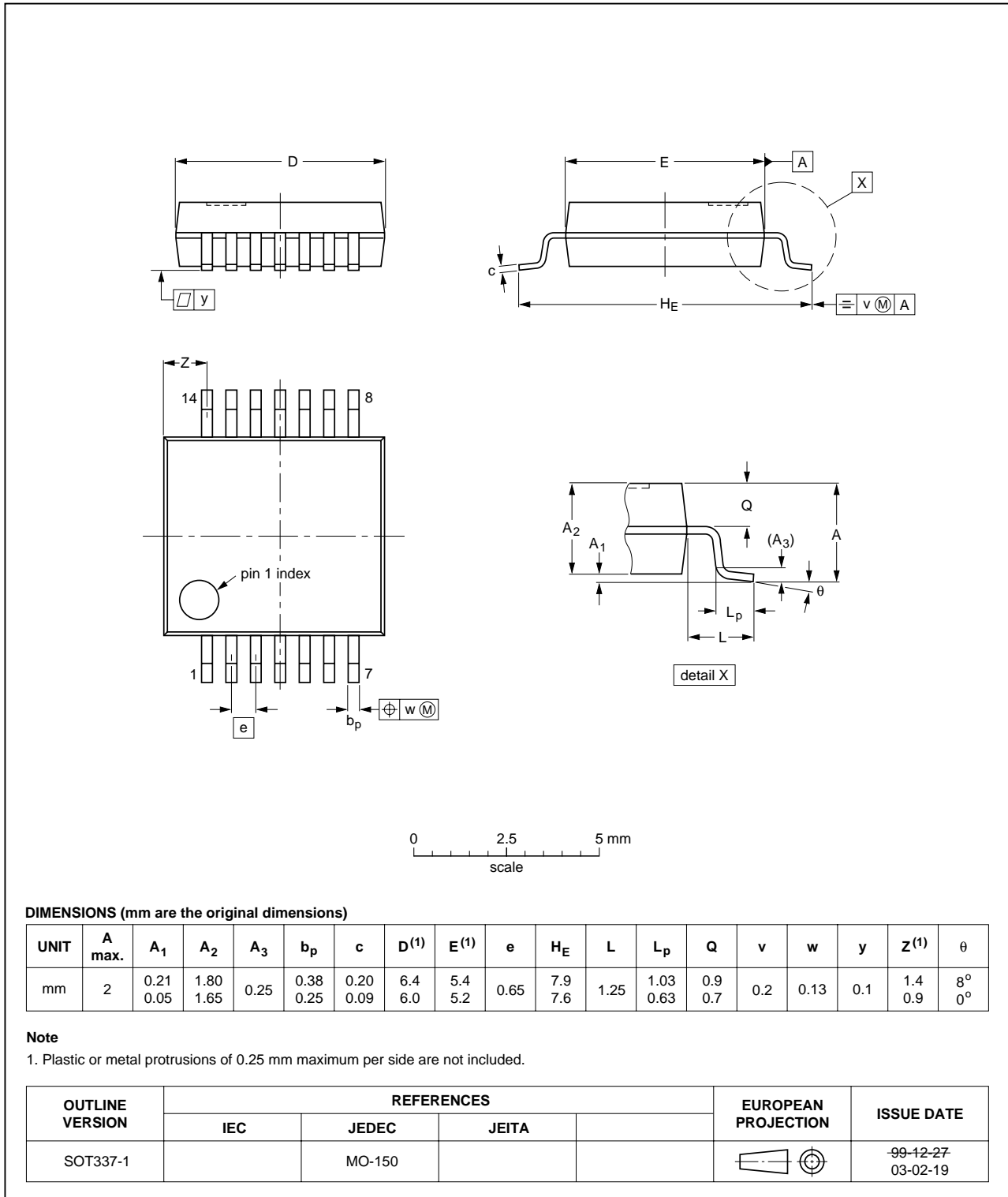


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SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm

SOT337-1

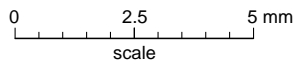
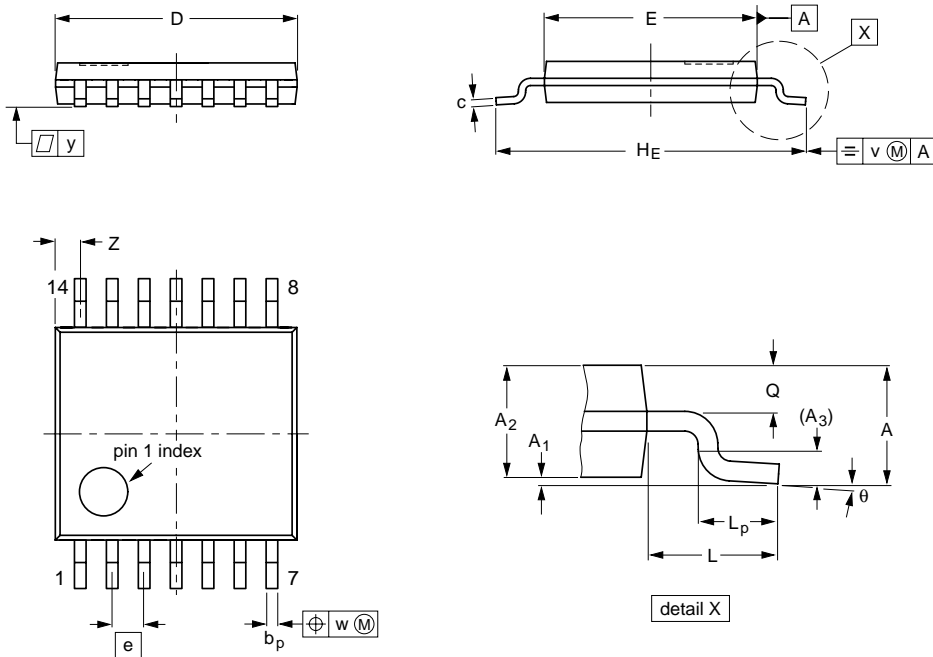


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TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm

SOT402-1



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A ₁	A ₂	A ₃	b _p	c	D ⁽¹⁾	E ⁽²⁾	e	H _E	L	L _p	Q	v	w	y	z ⁽¹⁾	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	0.72 0.38	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.

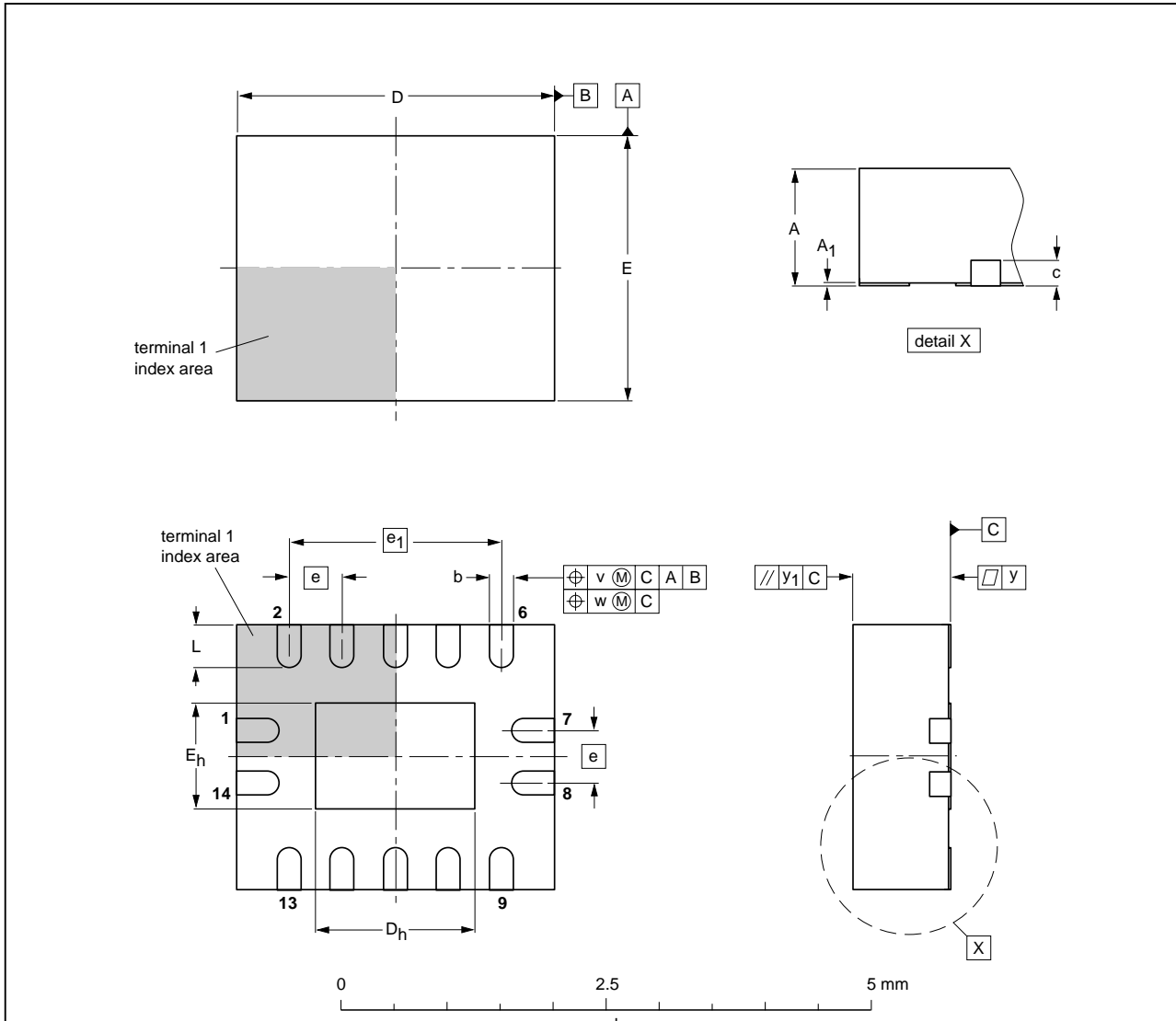
OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT402-1		MO-153			99-12-27 03-02-18

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DHVQFN14: plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body 2.5 x 3 x 0.85 mm

SOT762-1



DIMENSIONS (mm are the original dimensions)

UNIT	A ⁽¹⁾ max.	A ₁	b	c	D ⁽¹⁾	D _h	E ⁽¹⁾	E _h	e	e ₁	L	v	w	y	y ₁
mm	1	0.05 0.00	0.30 0.18	0.2	3.1 2.9	1.65 1.35	2.6 2.4	1.15 0.85	0.5	2	0.5 0.3	0.1	0.05	0.05	0.1

Note

1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA		
SOT762-1	---	MO-241	---		02-10-17 03-01-27

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