

# HEF4952B

## 8-channel analog multiplexer/demultiplexer

Rev. 01 — 20 March 2006

Product data sheet

### 1. General description

The HEF4952B is a small signal switch providing a dual 5-channel analog multiplexer/demultiplexer with common select logic. Each multiplexer has four independent inputs/outputs (pins nY0 to nY3) and a common input/output (pin nZ). Via one channel, channel nY2 and nY3 can be connected to  $V_{SS}$ .

$V_{SS}$  and  $V_{DD}$  are the supply voltage pins for the digital control inputs (pins A0 to A2).

### 2. Features

- Schmitt-trigger action at control inputs
- Small signal switch
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$

### 3. Applications

- Analog multiplexing and demultiplexing
- Digital multiplexing and demultiplexing
- Signal gating

### 4. Ordering information

Table 1. Ordering information

Type number	Package			
	Temperature range	Name	Description	Version
HEF4952BT	$-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1

**PHILIPS**

5. Functional diagram

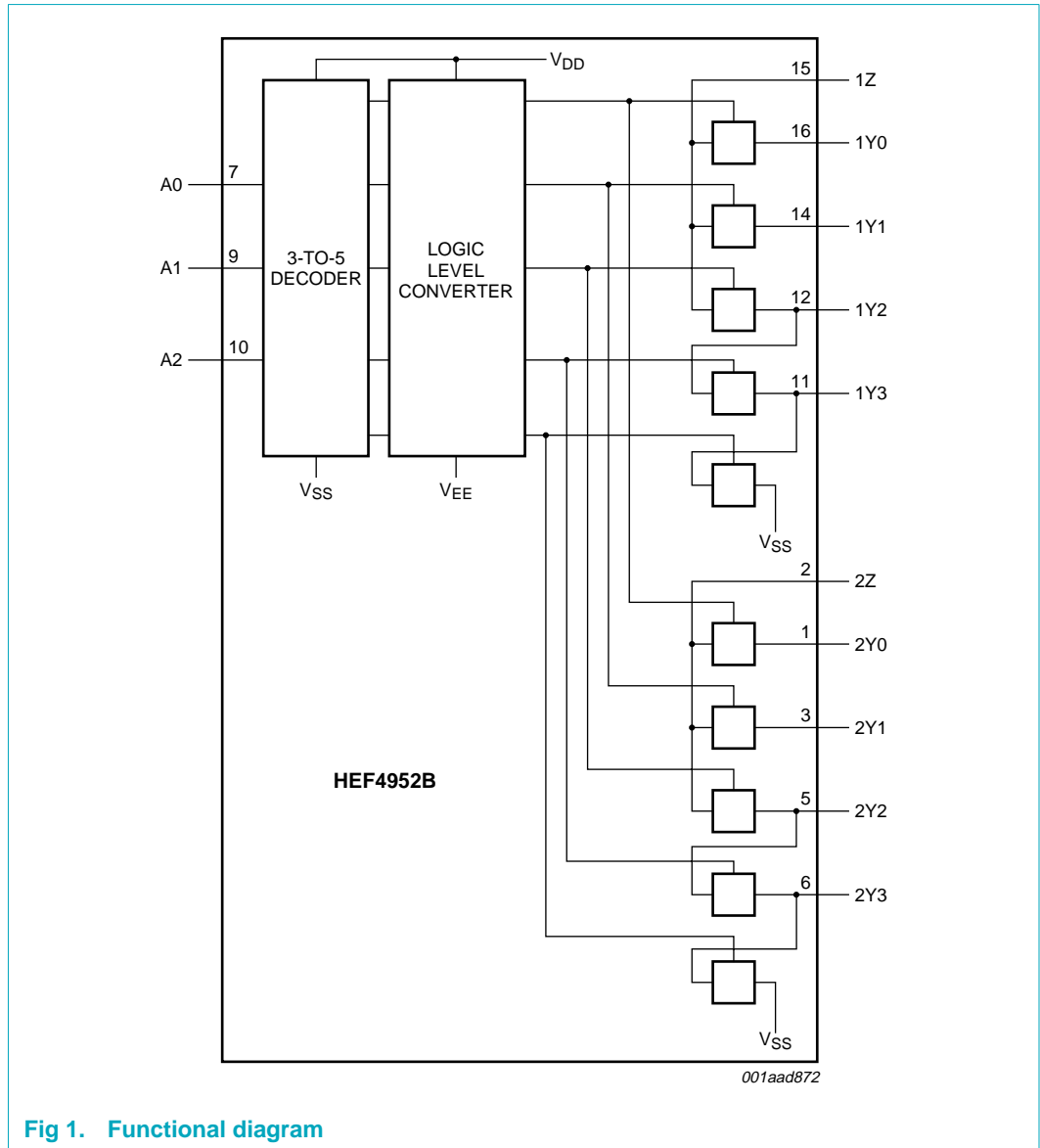
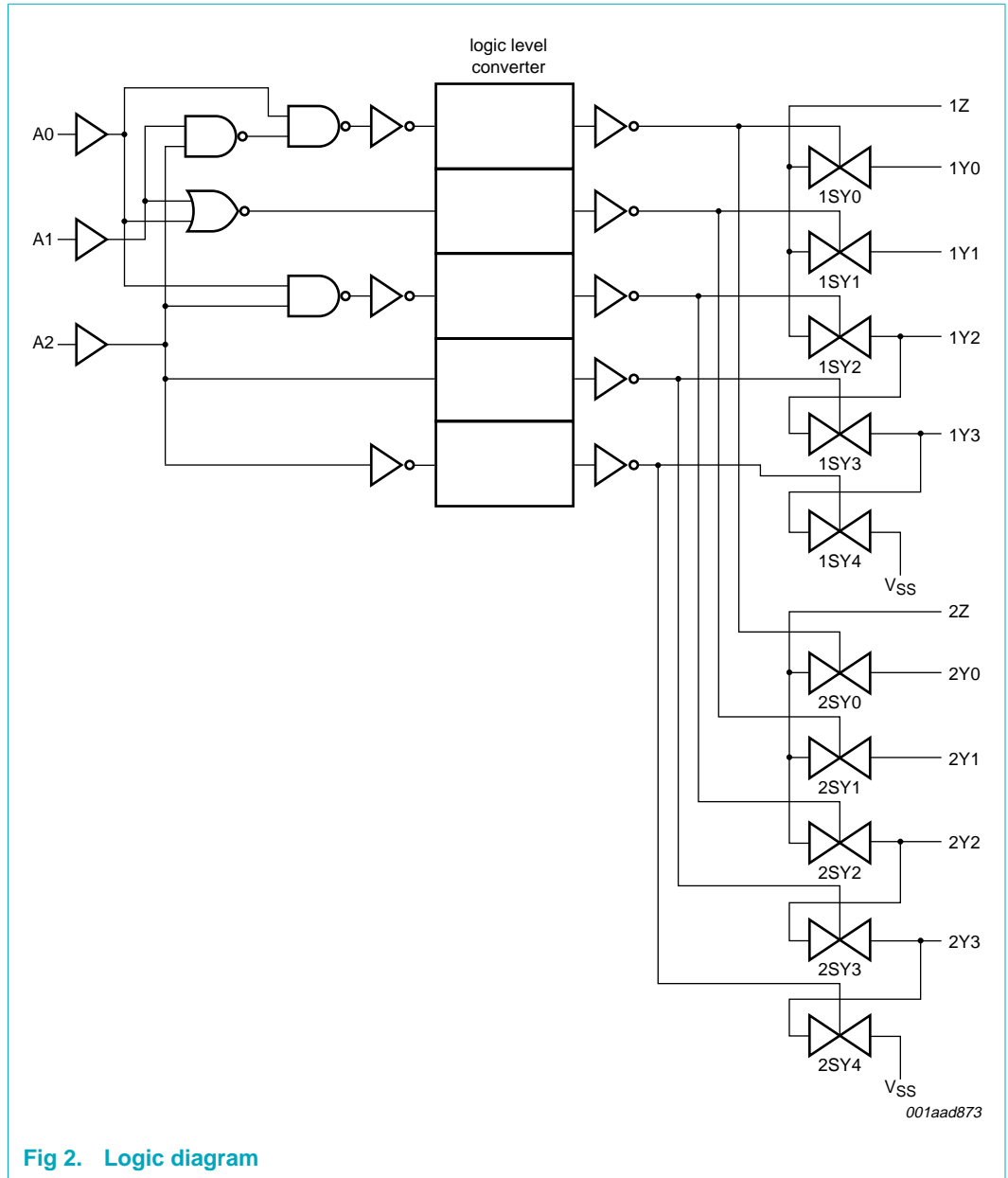


Fig 1. Functional diagram



## 6. Pinning information

### 6.1 Pinning

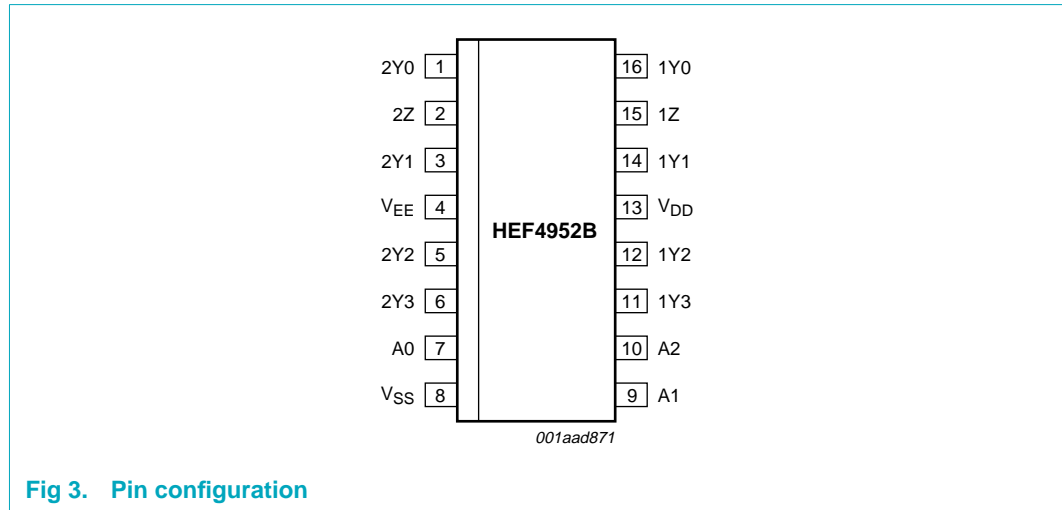


Fig 3. Pin configuration

### 6.2 Pin description

Table 2: Pin description

Symbol	Pin	Description
2Y0	1	channel 2 independent input 0 or output 0
2Z	2	channel 2 common input or output
2Y1	3	channel 2 independent input 1 or output 1
V <sub>EE</sub>	4	supply voltage of switches
2Y2	5	channel 2 independent input 2 or output 2
2Y3	6	channel 2 independent input 3 or output 3
A0	7	address input 0
V <sub>SS</sub>	8	ground
A1	9	address input 1
A2	10	address input 2
1Y3	11	channel 1 independent input 3 or output 3
1Y2	12	channel 1 independent input 2 or output 2
V <sub>DD</sub>	13	supply voltage
1Y1	14	channel 1 independent input 1 or output 1
1Z	15	channel 1 common input or output
1Y0	16	channel 1 independent input 0 or output 0

## 7. Functional description

### 7.1 Function table

Table 3: Function table

Input			Switch				
A2	A1	A0	nSY0	nSY1	nSY2	nSY3	nSY4
L	L	L	off	on	off	off	on
L	L	H	on	off	off	off	on
L	H	L	off	off	on	off	on
L	H	H	on	off	on	off	on
H	L	L	off	on	off	on	off
H	L	H	on	off	off	on	off
H	H	L	off	off	on	on	off
H	H	H	off	off	off	on	off

## 8. Limiting values

Table 4: Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{DD}$	quiescent supply voltage		[1] -0.5	+18	V
$V_{EE}$	supply voltage	referenced to $V_{DD}$	[1] -18	+0.5	V
$V_I$	input voltage		-0.5	$V_{DD} + 0.5$	V
$I_I$	input current		-	$\pm 10$	mA
$T_{stg}$	storage temperature		-65	+150	°C
$T_{amb}$	ambient temperature		-40	+85	°C
$P_{tot}$	total power dissipation	$T_{amb} = -40\text{ °C to }+85\text{ °C}$	[2] -	500	mW
$P_o$	power dissipation per output		-	100	mW

[1] To avoid drawing  $V_{DD}$  current out of terminal Z, when switch current flows into terminals Y, the voltage drop across the bidirectional switch must not exceed 0.4 V. If the switch current flows into terminal Z, no  $V_{DD}$  current will flow out of terminals Y; in this case there is no limit for the voltage drop across the switch, but the voltages at Y and Z may not exceed  $V_{DD}$  or  $V_{EE}$ .

[2]  $P_{tot}$  derates linearly with 8 mW/K above 70 °C.

### 9. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$V_{DD}$	supply voltage	see Figure 4	5	-	15	V
$V_{EE}$	supply voltage	see Figure 4	0	-	-15	V

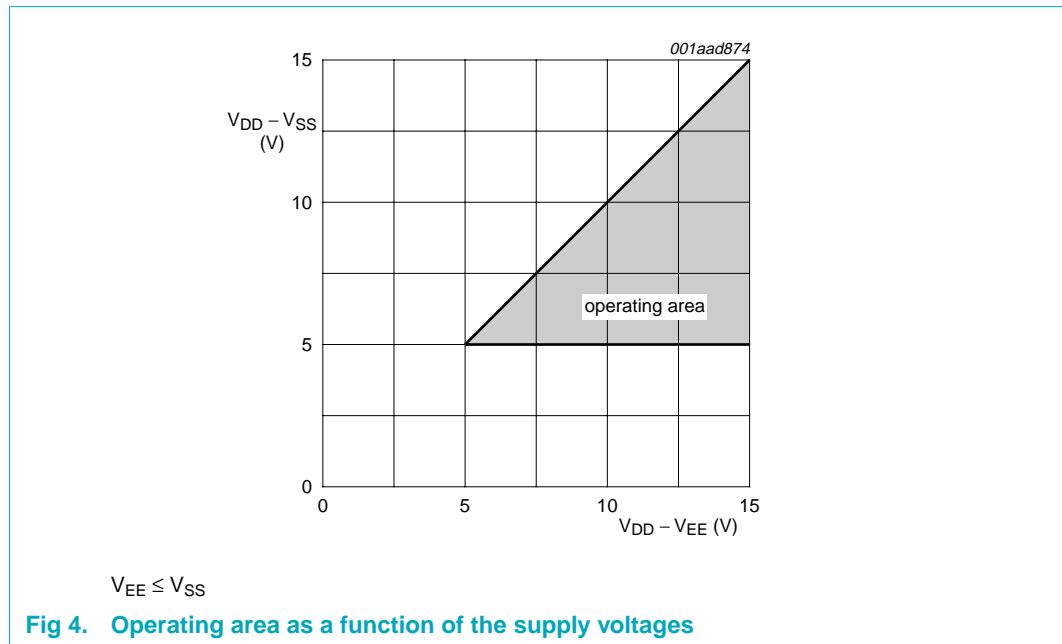


Fig 4. Operating area as a function of the supply voltages

### 10. Static characteristics

Table 6: Static characteristics

Voltages are referenced to  $V_{SS}$  ( $V_{SS} = 0$  V); unless otherwise specified.

Symbol	Parameter	Conditions	$T_{amb} = -40\text{ }^{\circ}\text{C}$		$T_{amb} = 25\text{ }^{\circ}\text{C}$		$T_{amb} = 85\text{ }^{\circ}\text{C}$		Unit
			Min	Max	Min	Max	Min	Max	
$I_{DD}$	quiescent supply current	all valid input combinations; $V_i = V_{SS}$ or $V_{DD}$ ; $I_O = 0$ A							
		$V_{DD} = 5$ V	-	20	-	20	-	150	$\mu\text{A}$
		$V_{DD} = 10$ V	-	40	-	40	-	300	$\mu\text{A}$
		$V_{DD} = 15$ V	-	80	-	80	-	600	$\mu\text{A}$
$I_{LI}$	input leakage current	$V_i = 0$ V or 15 V; $V_{DD} = 15$ V	-	0.3	-	0.3	-	1.0	$\mu\text{A}$
$I_{L(OZ)}$	3-state output leakage current	$V_{DD} = 15$ V							
		output returned to $V_{DD}$	-	1.6	-	1.6	-	12.0	$\mu\text{A}$
		output returned to $V_{SS}$	-	-1.6	-	-1.6	-	-12.0	$\mu\text{A}$
$C_i$	input capacitance	digital inputs	-	-	-	7.5	-	-	pF

**Table 7: Control input characteristics**

Voltages are referenced to  $V_{SS}$  ( $V_{SS} = 0\text{ V}$ ); unless otherwise specified.

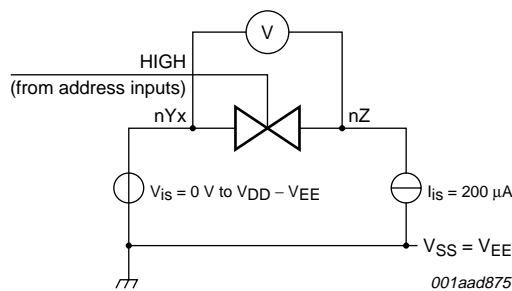
Symbol	Parameter	Conditions	$T_{amb} = 25\text{ }^\circ\text{C}$		$T_{amb} = -40\text{ }^\circ\text{C to } +85\text{ }^\circ\text{C}$		Unit
			Min	Max	Min	Max	
$V_{T+}$	positive-going threshold	$V_{DD} = 5\text{ V}$	-	2.90	-	3.00	V
		$V_{DD} = 10\text{ V}$	-	4.37	-	4.50	V
$V_{T-}$	negative-going threshold	$V_{DD} = 5\text{ V}$	1.03	-	1.00	-	V
		$V_{DD} = 10\text{ V}$	2.10	-	2.00	-	V
$V_H$	hysteresis ( $V_{T+} - V_{T-}$ )	$V_{DD} = 5\text{ V}$	0.16	-	0.10	-	V
		$V_{DD} = 10\text{ V}$	0.11	-	0.10	-	V

**Table 8:  $R_{ON}$  switch characteristics**

$T_{amb} = 25\text{ }^\circ\text{C}$ ; for test conditions see [Figure 5](#).

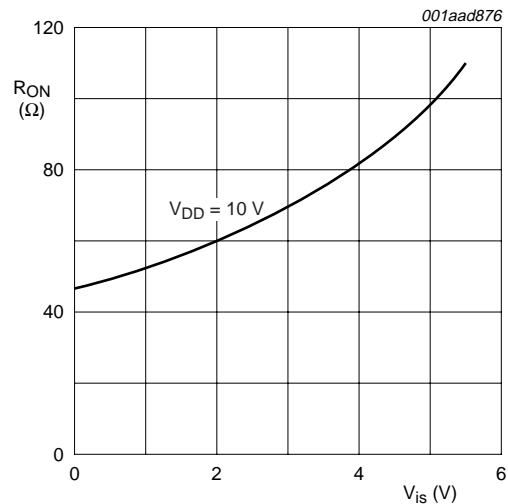
$V_{is}$  is the input voltage at a Y or Z terminal, whichever is assigned as input.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{ON}$	ON resistance	$V_{DD} - V_{EE} = 10\text{ V}$ ; see <a href="#">Figure 6</a>				
		$V_{is} = 0\text{ V}$	-	45	150	$\Omega$
		$V_{is} = 2.5\text{ V}$	-	65	170	$\Omega$
		$V_{is} = 5.0\text{ V}$	-	110	360	$\Omega$
$\Delta R_{ON}$	ON resistance mismatch between channels	$V_{is} = 2.5\text{ V}$ ; $V_{DD} - V_{EE} = 10\text{ V}$	-	10	-	$\Omega$
$I_{L(OFF)}$	OFF-state leakage current	$V_{DD} - V_{EE} = 15\text{ V}$	-	-	200	nA



$$R_{ON} = \frac{V}{I_{is}}$$

**Fig 5. Test set-up for measuring ON resistance**



$I_{is} = 200\text{ }\mu\text{A}$ ;  $V_{SS} = V_{EE} = 0\text{ V}$

**Fig 6. Typical ON resistance as a function of the input voltage**

## 11. Dynamic characteristics

**Table 9. Dynamic characteristics**

$V_{EE} = V_{SS} = 0$  V;  $T_{amb} = 25$  °C; input transition times  $\leq 20$  ns; test circuit see [Figure 7](#).

$V_{is}$  is the input voltage at a Y or Z terminal, whichever is assigned as input.  $V_{os}$  is the output voltage at a Y or Z terminal, whichever is assigned as output.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t <sub>PHL</sub>	HIGH-to-LOW propagation delay $V_{is}$ to $V_{os}$	$V_{is} = 1.0$ V (square-wave)				
		$V_{DD} = 5$ V	-	5	-	ns
		$V_{DD} = 10$ V	-	3	6	ns
		$V_{DD} = 15$ V	-	2	-	ns
t <sub>PLH</sub>	LOW-to-HIGH propagation delay $V_{is}$ to $V_{os}$	$V_{is} = 1.0$ V (square-wave)				
		$V_{DD} = 5$ V	-	5	-	ns
		$V_{DD} = 10$ V	-	3	6	ns
		$V_{DD} = 15$ V	-	2	-	ns
t <sub>PZL</sub>	3-state output enable time to LOW-state $A_n$ to $V_{os}$	$V_{An} = V_{DD}$ (square-wave); $V_{is} = V_{EE}$				
		$V_{DD} = 5$ V	-	125	-	ns
		$V_{DD} = 10$ V	-	50	100	ns
		$V_{DD} = 15$ V	-	35	-	ns
t <sub>PZH</sub>	3-state output enable time to HIGH-state $A_n$ to $V_{os}$	$V_{An} = V_{DD}$ (square-wave); $V_{is} = 1$ V				
		$V_{DD} = 5$ V	-	125	-	ns
		$V_{DD} = 10$ V	-	50	100	ns
		$V_{DD} = 15$ V	-	35	-	ns
P <sub>D</sub>	dynamic power dissipation		[1]	-	-	-

[1] Dynamic power dissipation P<sub>D</sub> can be calculated with the following formula (P<sub>D</sub> in  $\mu$ W).

$$P_D = P \times f_i + \Sigma (f_o \times C_L) \times V_{DD}^2$$

Where:

P = 1300 for  $V_{DD} = 5$  V; P = 6100 for  $V_{DD} = 10$  V; P = 15600 for  $V_{DD} = 15$  V;

$f_i$  = input frequency in MHz;

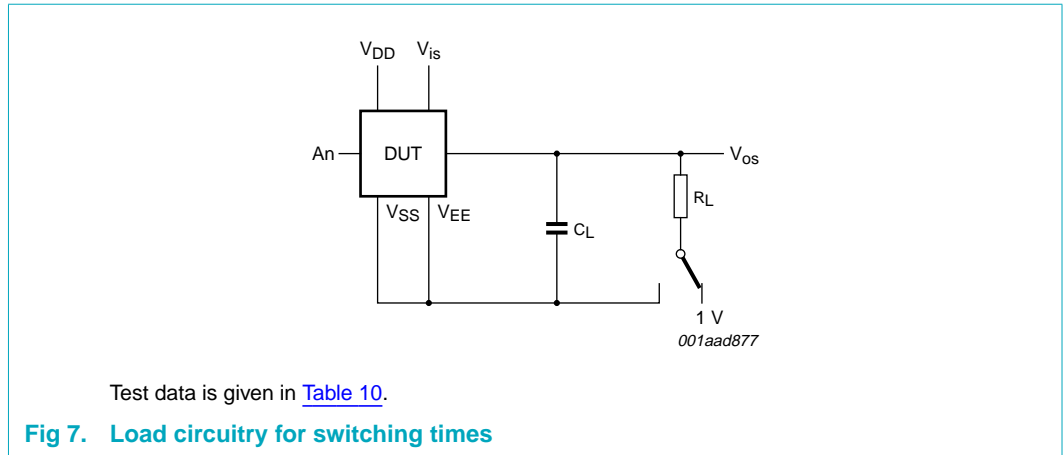
$f_o$  = output frequency in MHz;

$C_L$  = output load capacitance in pF;

$V_{DD}$  = supply voltage in V;

$\Sigma(C_L \times f_o)$  = sum of the outputs.





**Table 10. Test data**

Test	Input		Load		Switch position
	An	V <sub>is</sub>	C <sub>L</sub>	R <sub>L</sub>	
t <sub>PHL</sub>	-	1.0 V	50 pF	10 kΩ	V <sub>EE</sub> , V <sub>SS</sub>
t <sub>PLH</sub>	-	1.0 V	50 pF	10 kΩ	V <sub>EE</sub> , V <sub>SS</sub>
t <sub>PZL</sub>	V <sub>DD</sub>	V <sub>EE</sub>	50 pF	10 kΩ	1 V
t <sub>PZH</sub>	V <sub>DD</sub>	1.0 V	50 pF	10 kΩ	V <sub>EE</sub> , V <sub>SS</sub>

12. Package outline

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

SOT109-1

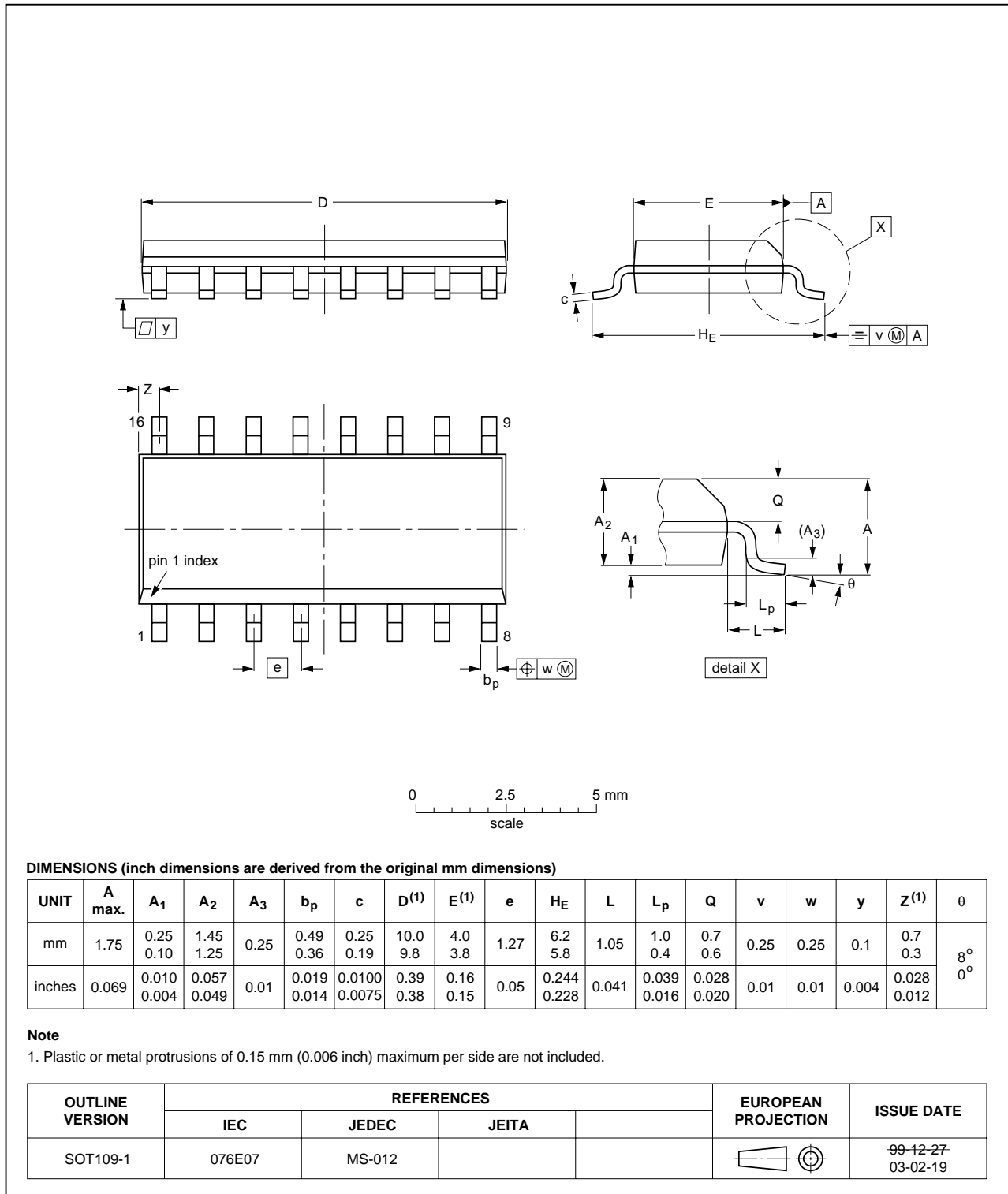


Fig 8. Package outline SOT109-1 (SO16)

## 13. Revision history

Table 11: Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
HEF4952B_1	20060320	Product data sheet	-	-

## 14. Legal information

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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.
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[2] The term 'short data sheet' is explained in section "Definitions".

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