

HEF4082B

Dual 4-input AND gate

Rev. 6 — 28 May 2015

Product data sheet

1. General description

The HEF4082B is a dual 4-input AND gate. The outputs are fully buffered for highest noise immunity and pattern insensitivity to output impedance variations.

It operates over a recommended V_{DD} power supply range of 3 V to 15 V referenced to V_{SS} (usually ground). Unused inputs must be connected to V_{DD} , V_{SS} , or another input.

2. Features and benefits

- Fully static operation
- 5 V, 10 V, and 15 V parametric ratings
- Standardized symmetrical output characteristics
- Inputs and outputs are protected against electrostatic effects
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$ and $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$
- Complies with JEDEC standard JESD 13-B

3. Ordering information

Table 1. Ordering information

All types operate from $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$.

Type number	Package		
	Name	Description	Version
HEF4082BT	SO14	plastic small outline package; 14 leads; body width 3.9 mm	SOT108-1

4. Functional diagram

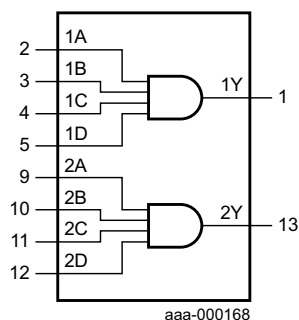


Fig 1. Functional diagram

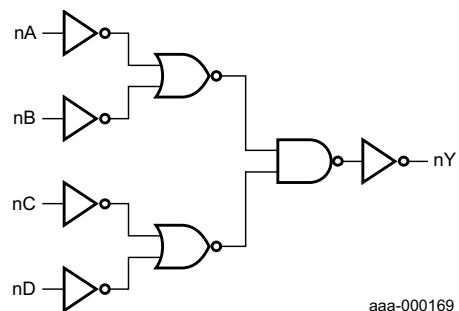


Fig 2. Logic diagram (one gate)

5. Pinning information

5.1 Pinning

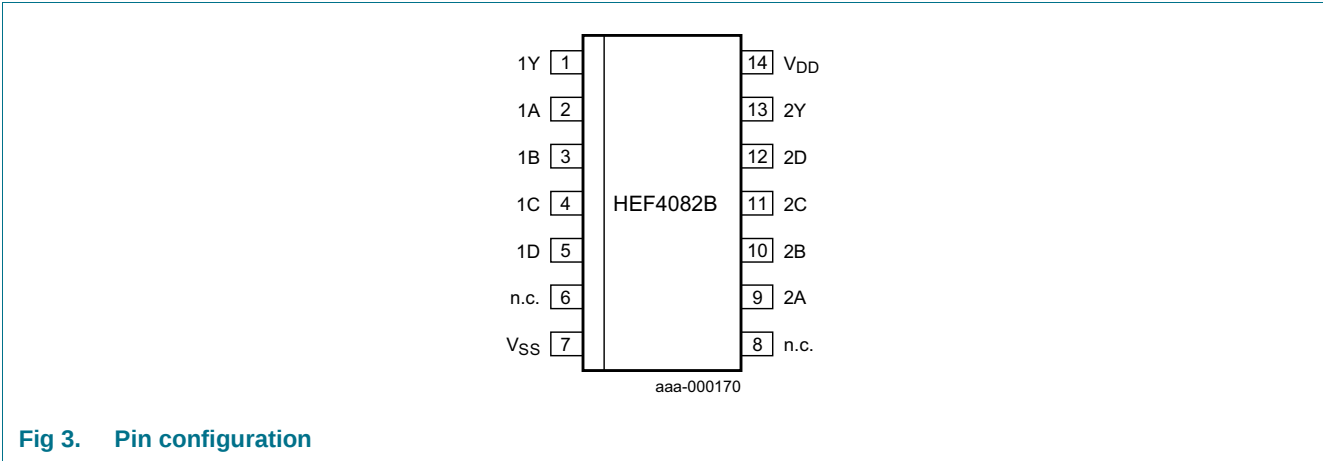


Fig 3. Pin configuration

5.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1A, 1B, 1C, 1D	2, 3, 4, 5	input
2A, 2B, 2C, 2D	9, 10, 11, 12	input
1Y, 2Y	1, 13	output
n.c.	6, 8	not connected
VSS	7	ground (0 V)
VDD	14	supply voltage

6. Functional description

Table 3. Function table^[1]

Input				Output
nA	nB	nC	nD	nY
L	X	X	X	L
X	L	X	X	L
X	X	L	X	L
X	X	X	L	L
H	H	H	H	H

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

7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to $V_{SS} = 0$ V (ground).

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DD}	supply voltage		-0.5	+18	V
I_{IK}	input clamping current	$V_I < -0.5$ V or $V_I > V_{DD} + 0.5$ V	-	± 10	mA
V_I	input voltage		-0.5	$V_{DD} + 0.5$	V
I_{OK}	output clamping current	$V_O < -0.5$ V or $V_O > V_{DD} + 0.5$ V	-	± 10	mA
I_{IO}	input/output current		-	± 10	mA
I_{DD}	supply current		-	50	mA
T_{stg}	storage temperature		-65	+150	°C
T_{amb}	ambient temperature		-40	+125	°C
P_{tot}	total power dissipation	$T_{amb} = -40$ °C to $+125$ °C			
		SO14 [1]	-	500	mW
P	power dissipation	per output	-	100	mW

[1] For SO14 packages: above $T_{amb} = 70$ °C, P_{tot} derates linearly with 8 mW/K.

8. Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V_{DD}	supply voltage		3	15	V
V_I	input voltage		0	V_{DD}	V
T_{amb}	ambient temperature	in free air	-40	+125	°C
$\Delta t/\Delta V$	input transition rise and fall rate	$V_{DD} = 5$ V	-	3.75	ns/V
		$V_{DD} = 10$ V	-	0.5	ns/V
		$V_{DD} = 15$ V	-	0.08	ns/V

9. Static characteristics

Table 6. Static characteristics

$V_{SS} = 0\text{ V}$; $V_I = V_{SS}$ or V_{DD} ; unless otherwise specified.

Symbol	Parameter	Conditions	V_{DD}	$T_{amb} = -40\text{ °C}$		$T_{amb} = +25\text{ °C}$		$T_{amb} = +85\text{ °C}$		$T_{amb} = +125\text{ °C}$		Unit
				Min	Max	Min	Max	Min	Max	Min	Max	
V_{IH}	HIGH-level input voltage	$ I_O < 1\text{ }\mu\text{A}$	5 V	3.5	-	3.5	-	3.5	-	3.5	-	V
			10 V	7.0	-	7.0	-	7.0	-	7.0	-	V
			15 V	11.0	-	11.0	-	11.0	-	11.0	-	V
V_{IL}	LOW-level input voltage	$ I_O < 1\text{ }\mu\text{A}$	5 V	-	1.5	-	1.5	-	1.5	-	1.5	V
			10 V	-	3.0	-	3.0	-	3.0	-	3.0	V
			15 V	-	4.0	-	4.0	-	4.0	-	4.0	V
V_{OH}	HIGH-level output voltage	$ I_O < 1\text{ }\mu\text{A}$	5 V	4.95	-	4.95	-	4.95	-	4.95	-	V
			10 V	9.95	-	9.95	-	9.95	-	9.95	-	V
			15 V	14.95	-	14.95	-	14.95	-	14.95	-	V
V_{OL}	LOW-level output voltage	$ I_O < 1\text{ }\mu\text{A}$	5 V	-	0.05	-	0.05	-	0.05	-	0.05	V
			10 V	-	0.05	-	0.05	-	0.05	-	0.05	V
			15 V	-	0.05	-	0.05	-	0.05	-	0.05	V
I_{OH}	HIGH-level output current	$V_O = 2.5\text{ V}$	5 V	-	-1.7	-	-1.4	-	-1.1	-	-1.1	mA
		$V_O = 4.6\text{ V}$	5 V	-	-0.64	-	-0.5	-	-0.36	-	-0.36	mA
		$V_O = 9.5\text{ V}$	10 V	-	-1.6	-	-1.3	-	-0.9	-	-0.9	mA
		$V_O = 13.5\text{ V}$	15 V	-	-4.2	-	-3.4	-	-2.4	-	-2.4	mA
I_{OL}	LOW-level output current	$V_O = 0.4\text{ V}$	5 V	0.64	-	0.5	-	0.36	-	0.36	-	mA
		$V_O = 0.5\text{ V}$	10 V	1.6	-	1.3	-	0.9	-	0.9	-	mA
		$V_O = 1.5\text{ V}$	15 V	4.2	-	3.4	-	2.4	-	2.4	-	mA
I_I	input leakage current		15 V	-	± 0.1	-	± 0.1	-	± 1.0	-	± 1.0	μA
I_{DD}	supply current	all valid input combinations; $I_O = 0\text{ A}$	5 V	-	0.25	-	0.25	-	7.5	-	7.5	μA
			10 V	-	0.5	-	0.5	-	15.0	-	15.0	μA
			15 V	-	1.0	-	1.0	-	30.0	-	30.0	μA
C_I	input capacitance			-	-	-	7.5	-	-	-	-	pF

10. Dynamic characteristics

Table 7. Dynamic characteristics

$T_{amb} = 25\text{ }^{\circ}\text{C}$; $C_L = 50\text{ pF}$; $t_r = t_f \leq 20\text{ ns}$; waveforms see [Figure 4](#); test circuit see [Figure 5](#); unless otherwise specified. [\[1\]](#)

Symbol	Parameter	Conditions	V_{DD}	Extrapolation formula	Min	Typ	Max	Unit
t_{pd}	propagation delay	nA, nB, nC, nD to nY	5 V [2]	$38 + 0.55 \times C_L$	-	65	125	ns
			10 V	$19 + 0.23 \times C_L$	-	30	60	ns
			15 V	$17 + 0.16 \times C_L$	-	25	45	ns
t_{THL}	HIGH to LOW output transition time	nY	5 V	$10 + 1.0 \times C_L$	-	60	120	ns
			10 V	$9 + 0.42 \times C_L$	-	30	60	ns
			15 V	$6 + 0.28 \times C_L$	-	20	40	ns
t_{TLH}	LOW to HIGH output transition time	nY	5 V	$10 + 1.0 \times C_L$	-	60	120	ns
			10 V	$9 + 0.42 \times C_L$	-	30	60	ns
			15 V	$6 + 0.28 \times C_L$	-	20	40	ns

[1] The typical value of the propagation delay and output transition time can be calculated with the extrapolation formula (C_L in pF).

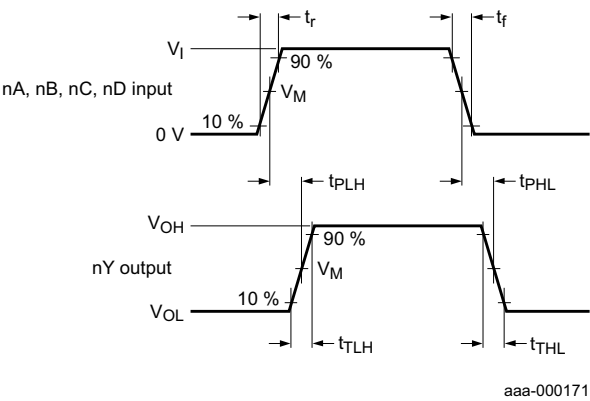
[2] t_{pd} is the same as t_{PHL} and t_{PLH} .

Table 8. Dynamic power dissipation

$V_{SS} = 0\text{ V}$; $t_r = t_f \leq 20\text{ ns}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$.

Symbol	Parameter	V_{DD}	Typical formula	where:
P_D	dynamic power dissipation	5 V	$P_D = 1500 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2\text{ (}\mu\text{W)}$	f_i = input frequency in MHz; f_o = output frequency in MHz; C_L = output load capacitance in pF; $\Sigma(f_o \times C_L)$ = sum of the outputs; V_{DD} = supply voltage in V.
		10 V	$P_D = 6700 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2\text{ (}\mu\text{W)}$	
		15 V	$P_D = 16800 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2\text{ (}\mu\text{W)}$	

11. Waveforms

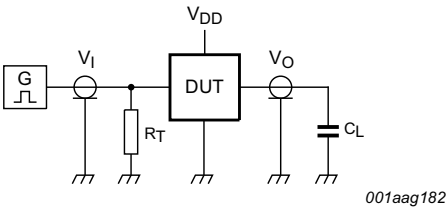


Measurement points are given in [Table 9](#).
Logic levels: VOL and VOH are typical output voltage levels that occur with the output load.

Fig 4. Input to output propagation delay and output transition times

Table 9. Measurement points

Supply voltage	Input	Output
VDD	VM	VM
5 V to 15 V	0.5VDD	0.5VDD



Test data is given in [Table 10](#).
Definitions for test circuit:
DUT = Device Under Test.
CL = load capacitance including jig and probe capacitance.
RT = termination resistance should be equal to the output impedance ZO of the pulse generator.

Fig 5. Test circuit for measuring switching times

Table 10. Test data

Supply voltage	Input		Load
VDD	VI	tr, tf	CL
5 V to 15 V	VSS or VDD	≤ 20 ns	50 pF

12. Package outline

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

SOT108-1

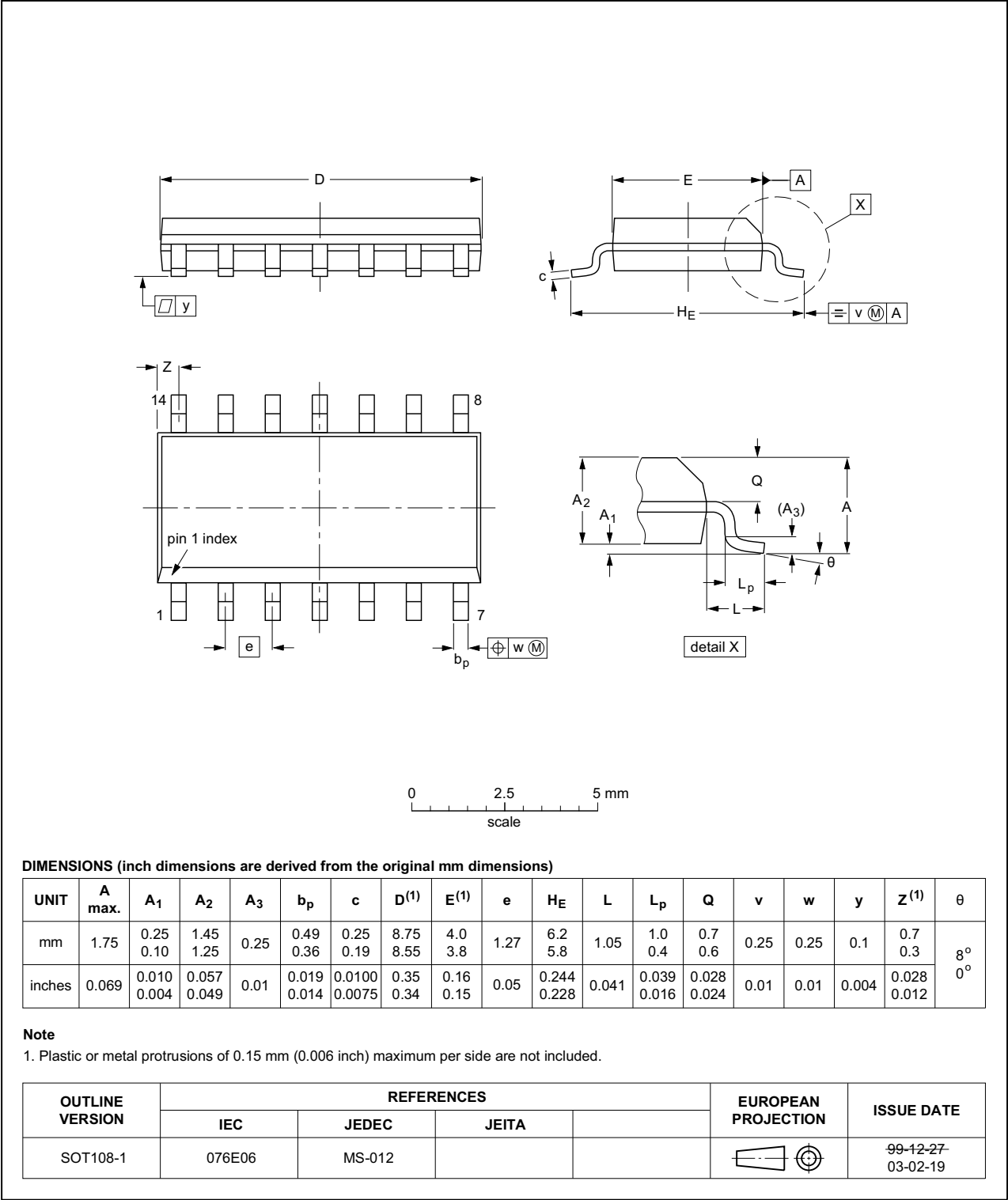


Fig 6. Package outline SOT108-1 (SO14)

13. Abbreviations

Table 11. Abbreviations

Acronym	Description
DUT	Device Under Test

14. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
HEF4082B v.6	20150528	Product data sheet	-	HEF4082B v.5
Modifications:	• Type number HEF4082BP (SOT27-1) removed.			
HEF4082B v.5	20111116	Product data sheet	-	HEF4082B v.4
Modifications:	• Legal pages updated. • Changes in “General description” and “Features and benefits”.			
HEF4082B v.4	20110823	Product data sheet	-	HEF4082B_CNV v.3
HEF4082B_CNV v.3	19950101	Product specification	-	HEF4082B_CNV v.2
HEF4082B_CNV v.2	19950101	Product specification	-	-

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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.
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Product [short] data sheet	Production	This document contains the product specification.

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

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