HEF4555B

1-of-4 decoder/demultiplexer

Rev. 5 — 18 November 2011 **Product data sheet**

1. General description

The HEF4555B contains two 1-of-4 decoders/demultiplexers. Each has two address inputs (nA0 and nA1, an active LOW enable input ($n\overline{E}$) and four mutually exclusive outputs which are active HIGH (nY0 to nY3). When used as a decoder, $n\overline{E}$ when HIGH, forces nY0 to nY3 LOW. When used as a demultiplexer, the appropriate output is selected by the information on nA0 and nA1 with $n\overline{E}$ as data input. All unselected outputs are LOW.

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
- Specified from –40 °C to +85 °C
- Complies with JEDEC standard JESD 13-B

3. Applications

- Code conversion
- Address decoding
- Demultiplexing: when using the enable input as data input

4. Ordering information

Table 1. Ordering information

All types operate from –40 °C to +85 °C.

Type number	Package		
	Name	**Description**	**Version**
HEF4555BP	DIP16	plastic dual in-line package; 16 leads (300 mil)	SOT38-4
HEF4555BT	SO16	plastic small outline package; 16 leads; body width 3.9 mm	SOT109-1

5. Functional diagram

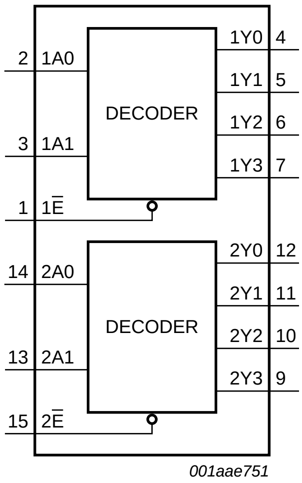


Fig 1. Functional diagram

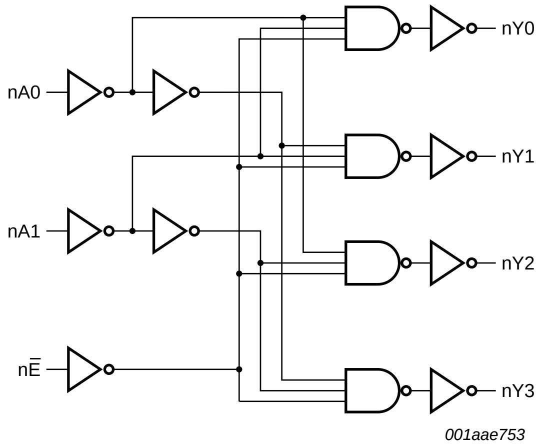


Fig 2. Logic diagram for one decoder/multiplexer

6. Pinning information

6.1 Pinning

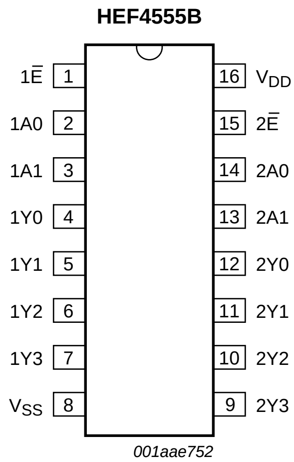


Fig 3. Pin configuration

6.2 Pin description

Table 2. Pin description

Symbol	Pin	Description
1A0, 1A1, 2A0, 2A1	2, 3, 14, 13	address input
$1\overline{E}$, $2\overline{E}$	1, 15	enable input (active LOW
1Y0, 1Y1, 1Y2, 1Y3, 2Y0, 2Y1, 2Y2, 2Y3	4, 5, 6, 7, 12, 11, 10, 9	output (active HIGH)
V_{DD}	16	supply voltage
V_{SS}	8	ground (GND)

7. Functional description

Table 3. Function selection[1]

Inputs			Outputs			
$n\overline{E}$	nA0	nA1	nY0	nY1	nY2	nY3
L	L	L	H	L	L	L
L	H	L	L	H	L	L
L	L	H	L	L	H	L
L	H	H	L	L	L	H
H	X	X	L	L	L	L

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

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}	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
$I_{I/O}$	input/output current			-	±10	mA
I_{DD}	supply current			-	50	mA
T_{stg}	storage temperature			–65	+150	°C
T_{amb}	ambient temperature			–40	+85	°C
P_{tot}	total power dissipation	DIP16 package	[1]	-	750	mW
		SO16 package	[2]	-	500	mW
P	power dissipation	per output		-	100	mW

[1] For DIP16 package: P_{tot} derates linearly with 12 mW/K above 70 °C.

[2] For SO16 package: 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		3	-	15	V
V_I	input voltage		0	-	V_{DD}	V
T_{amb}	ambient temperature	in free air	−40	-	+85	°C
Δt/ΔV	input transition rise and fall rate	V_{DD} = 5 V	-	-	3.75	μs/V
		V_{DD} = 10 V	-	-	0.5	μs/V
		V_{DD} = 15 V	-	-	0.08	μs/V

10. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions	V_{DD}	T_{amb} = −40 °C		T_{amb} = 25 °C		T_{amb} = 85 °C		Unit
				Min	Max	Min	Max	Min	Max	
V_{IH}	HIGH-level input voltage	$\|I_O\|$ < 1 μA	5 V	3.5	-	3.5	-	3.5	-	V
			10 V	7.0	-	7.0	-	7.0	-	V
			15 V	11.0	-	11.0	-	11.0	-	V
V_{IL}	LOW-level input voltage	$\|I_O\|$ < 1 μA	5 V	-	1.5	-	1.5	-	1.5	V
			10 V	-	3.0	-	3.0	-	3.0	V
			15 V	-	4.0	-	4.0	-	4.0	V
V_{OH}	HIGH-level output voltage	$\|I_O\|$ < 1 μA; V_I = V_{SS} or V_{DD}	5 V	4.95	-	4.95	-	4.95	-	V
			10 V	9.95	-	9.95	-	9.95	-	V
			15 V	14.95	-	14.95	-	14.95	-	V
V_{OL}	LOW-level output voltage	$\|I_O\|$ < 1 μA; V_I = V_{SS} or V_{DD}	5 V	-	0.05	-	0.05	-	0.05	V
			10 V	-	0.05	-	0.05	-	0.05	V
			15 V	-	0.05	-	0.05	-	0.05	V
I_{OH}	HIGH-level output current	V_O = 2.5 V	5 V	-	−1.7	-	−1.4	-	−1.1	mA
		V_O = 4.6 V	5 V	-	−0.52	-	−0.44	-	−0.36	mA
		V_O = 9.5 V	10 V	-	−1.3	-	−1.1	-	−0.9	mA
		V_O = 13.5 V	15 V	-	−3.6	-	−3.0	-	−2.4	mA
I_{OL}	LOW-level output current	V_O = 0.4 V	5 V	0.52	-	0.44	-	0.36	-	mA
		V_O = 0.5 V	10 V	1.3	-	1.1	-	0.9	-	mA
		V_O = 1.5 V	15 V	3.6	-	3.0	-	2.4	-	mA
I_I	input leakage current	V_{DD} = 15 V	15 V	-	±0.3	-	±0.3	-	±1.0	μA
I_{DD}	supply current	I_O = 0 A; V_I = V_{SS} or V_{DD}	5 V	-	20	-	20	-	150	μA
			10 V	-	40	-	40	-	300	μA
			15 V	-	80	-	80	-	600	μA
C_I	input capacitance		-	-	-	-	7.5	-	-	pF

11. Dynamic characteristics

Table 7. Dynamic characteristics

V_{SS} = 0 V; T_{amb} = 25 °C; for test circuit see Figure 5; unless otherwise specified.

Symbol	Parameter	Conditions	V_{DD}		Extrapolation formula	Min	Typ	Max	Unit
t_{PHL}	HIGH to LOW propagation delay	nAn → nYn; see Figure 4	5 V	[1]	88 ns + (0.55 ns/pF)C_L	-	115	230	ns
			10 V		34 ns + (0.23 ns/pF)C_L	-	45	90	ns
			15 V		22 ns + (0.16 ns/pF)C_L	-	30	65	ns
		$n\overline{E}$ → nYn	5 V		98 ns + (0.55 ns/pF)C_L	-	125	250	ns
			10 V		39 ns + (0.23 ns/pF)C_L	-	50	95	ns
			15 V		22 ns + (0.16 ns/pF C_L	-	30	65	ns
t_{PLH}	LOW to HIGH propagation delay	nAn → nYn	5 V	[1]	113 ns + (0.55 ns/pF)C_L	-	140	280	ns
			10 V		44 ns + (0.23 ns/pF)C_L	-	55	105	ns
			15 V		32 ns + (0.16 ns/pF)C_L	-	40	75	ns
		$n\overline{E}$ → nYn	5 V		123 ns + (0.55 ns/pF)C_L	-	150	295	ns
			10 V		44 ns + (0.23 ns/pF)C_L	-	55	110	ns
			15 V		32 ns + (0.16 ns/pF)C_L	-	40	75	ns
t_t	transition time	on nYn	5 V	[1][2]	10 ns + (1.00 ns/pF)C_L	-	60	120	ns
			10 V		9 ns + (0.42 ns/pF)C_L	-	30	60	ns
			15 V		6 ns + (0.28 ns/pF)C_L	-	20	40	ns

[1] The typical values of the propagation delay and transition times are calculated from the extrapolation formulas shown (C_L in pF).

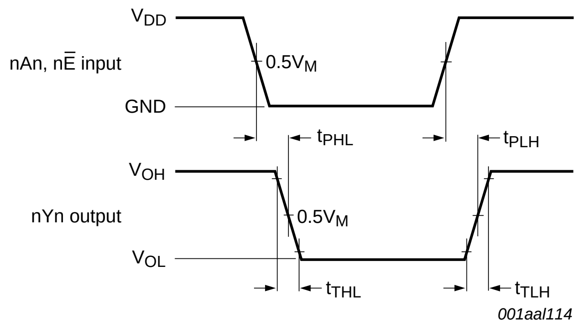
[2] Transition time t_t is the same as the HIGH to LOW and LOW to HIGH transition times t_{THL} and t_{TLH}.

Table 8. Dynamic power dissipation P_D

P_D can be calculated from the formulas shown. V_{SS} = 0 V; $t_r = t_f \leq 20$ ns; T_{amb} = 25 °C.

Symbol	Parameter	V_{DD}	Typical formula for P_D (μW)	Where:
P_D	dynamic power dissipation	5 V	$P_D = 4500 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$	f_i = input frequency in MHz,
		10 V	$P_D = 18800 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$	f_o = output frequency in MHz,
		15 V	$P_D = 45700 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$	C_L = output load capacitance in pF,
				V_{DD} = supply voltage in V,
				$\Sigma(f_o \times C_L)$ = sum of the outputs.

12. Waveforms



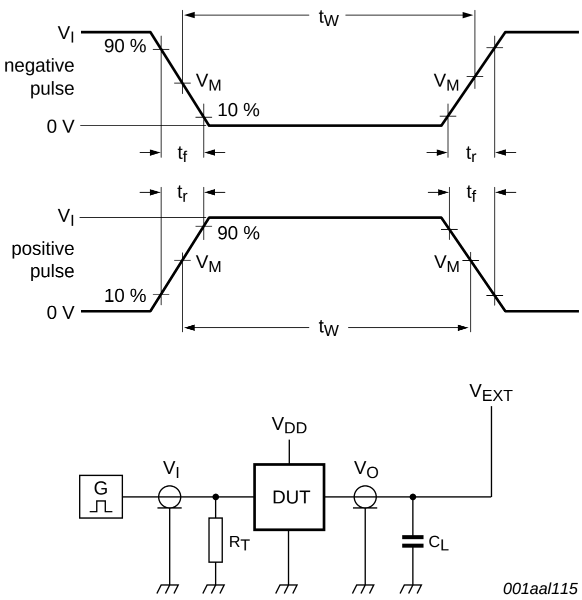
Measurement points are given in Table 9.

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

Fig 4. Inputs nAn and n$\overline{E}$ to output nYn propagation delays

Table 9. Measurement points

Supply voltage	Input	Output
V_{DD}	V_M	V_M
5 V to 15 V	$0.5V_{DD}$	$0.5V_{DD}$



Test data is given in Table 10.

Definitions for test circuit:

Device Under Test (DUT);

R_L = Load resistance;

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;

V_{EXT} = External voltage for measuring switching times.

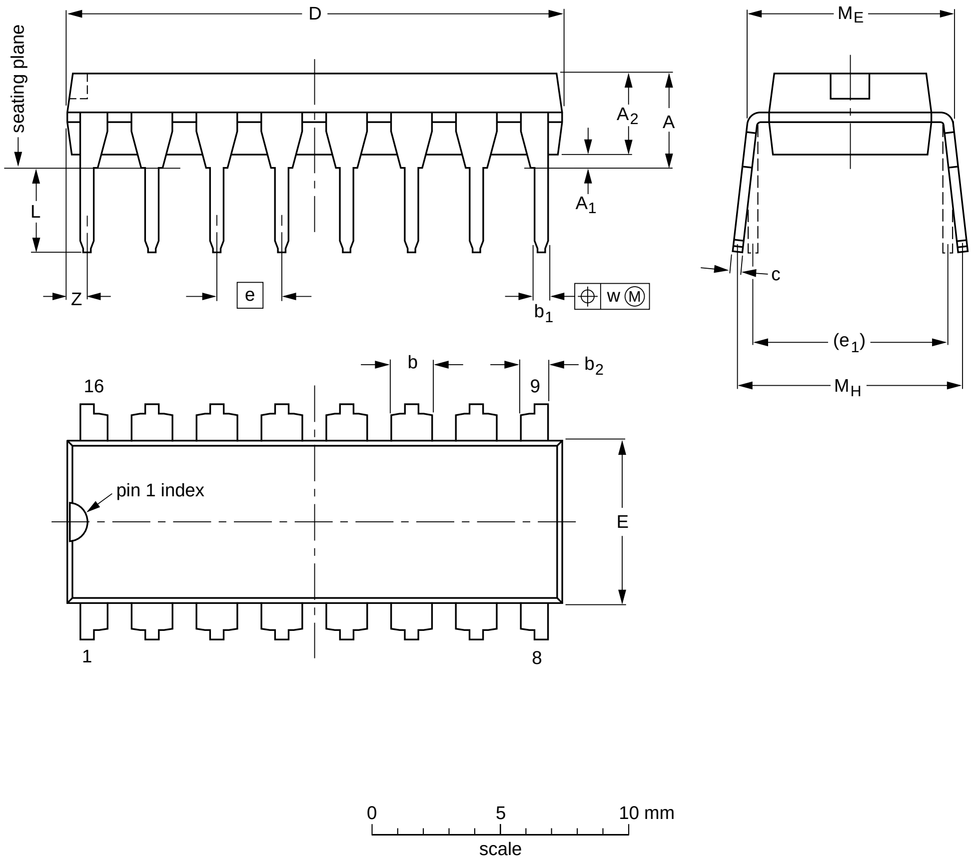
Fig 5. Load circuitry for switching times

Table 10. Test data

Supply voltage	Input		Load	V_{EXT}	
	V_I	$t_r = t_f$	C_L	t_{PLH}, t_{PHL}	t_{THL}, t_{TLH}
5 V to 15 V	V_{DD}	≤ 20 ns	50 pF	open	V_{DD}

13. Package outline

DIP16: plastic dual in-line package; 16 leads (300 mil) **SOT38-4**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1 min.	A_2 max.	b	b_1	b_2	c	$D^{(1)}$	$E^{(1)}$	e	e_1	L	M_E	M_H	w	$Z^{(1)}$ max.
mm	4.2	0.51	3.2	1.73 1.30	0.53 0.38	1.25 0.85	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	0.76
inches	0.17	0.02	0.13	0.068 0.051	0.021 0.015	0.049 0.033	0.014 0.009	0.77 0.73	0.26 0.24	0.1	0.3	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.03

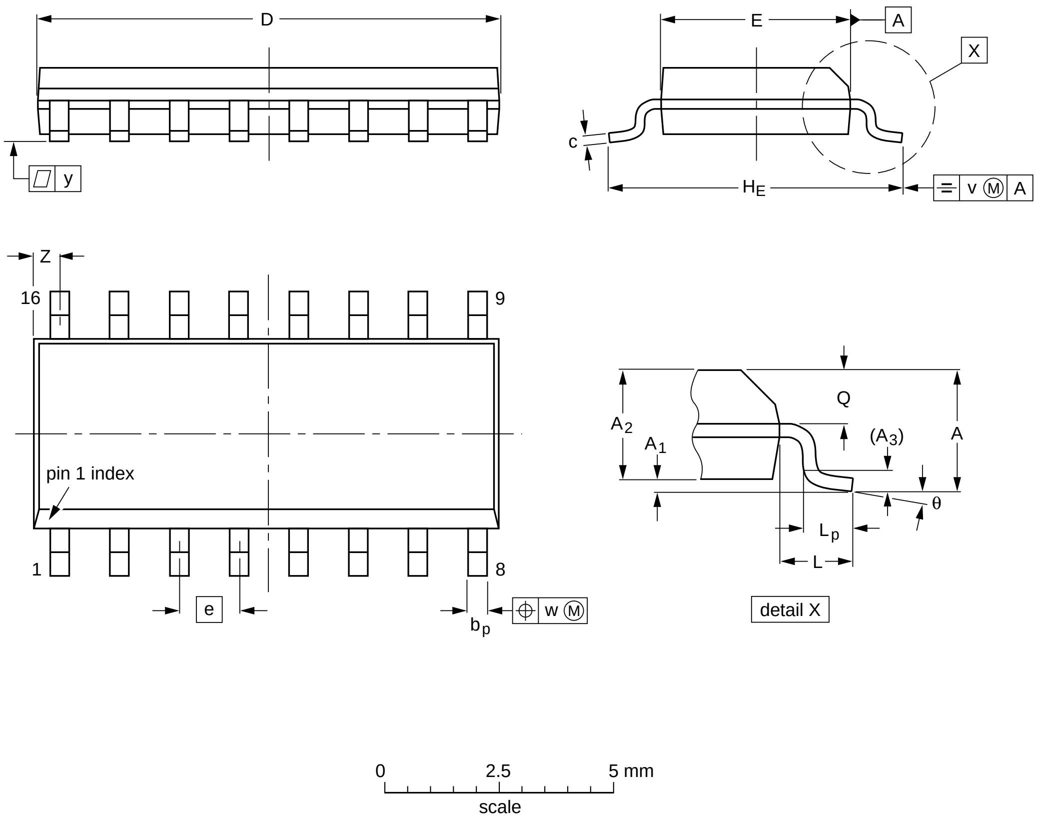
Note

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT38-4						~~95-01-14~~ 03-02-13

Fig 6. Package outline SOT38-4 (DIP16)

SO16: plastic small outline package; 16 leads; body width 3.9 mm **SOT109-1**



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	D[(1)]	E[(1)]	e	H_E	L	L_p	Q	v	w	y	Z[(1)]	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	10.0 9.8	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8° 0°
inches	0.069	0.010 0.004	0.057 0.049	0.01	0.019 0.014	0.0100 0.0075	0.39 0.38	0.16 0.15	0.05	0.244 0.228	0.041	0.039 0.016	0.028 0.020	0.01	0.01	0.004	0.028 0.012	

Note

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

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT109-1	076E07	MS-012				~~99-12-27~~ 03-02-19

Fig 7. Package outline SOT109-1 (SO16)

14. Revision history

Table 11. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
HEF4555B v.5	20111118	Product data sheet	-	HEF4555B v.4
Modifications:	• Table 6: I_{OH} minimum values changed to maximum			
HEF4555B v.4	20100106	Product data sheet	-	HEF4555B_CNV v.3
HEF4555B_CNV v.3	19950101	Product specification	-	HEF4555B_CNV v.2
HEF4555B_CNV v.2	19950101	Product specification	-	-

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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17. Contents

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