



HEF40244B

Octal buffers with 3-state outputs

Rev. 6 — 8 August 2024

Product data sheet

1. General description

The HEF40244B is an 8-bit buffer/line driver with 3-state outputs. The device can be used as two 4-bit buffers or one 8-bit buffer. The device features two output enables ($1\overline{OE}$ and $2\overline{OE}$), each controlling four of the 3-state outputs. A HIGH on $n\overline{OE}$ causes the outputs to assume a high-impedance OFF-state. Inputs include clamp diodes. This enables the use of current limiting resistors to interface inputs to voltages in excess of V_{CC} .

2. Features and benefits

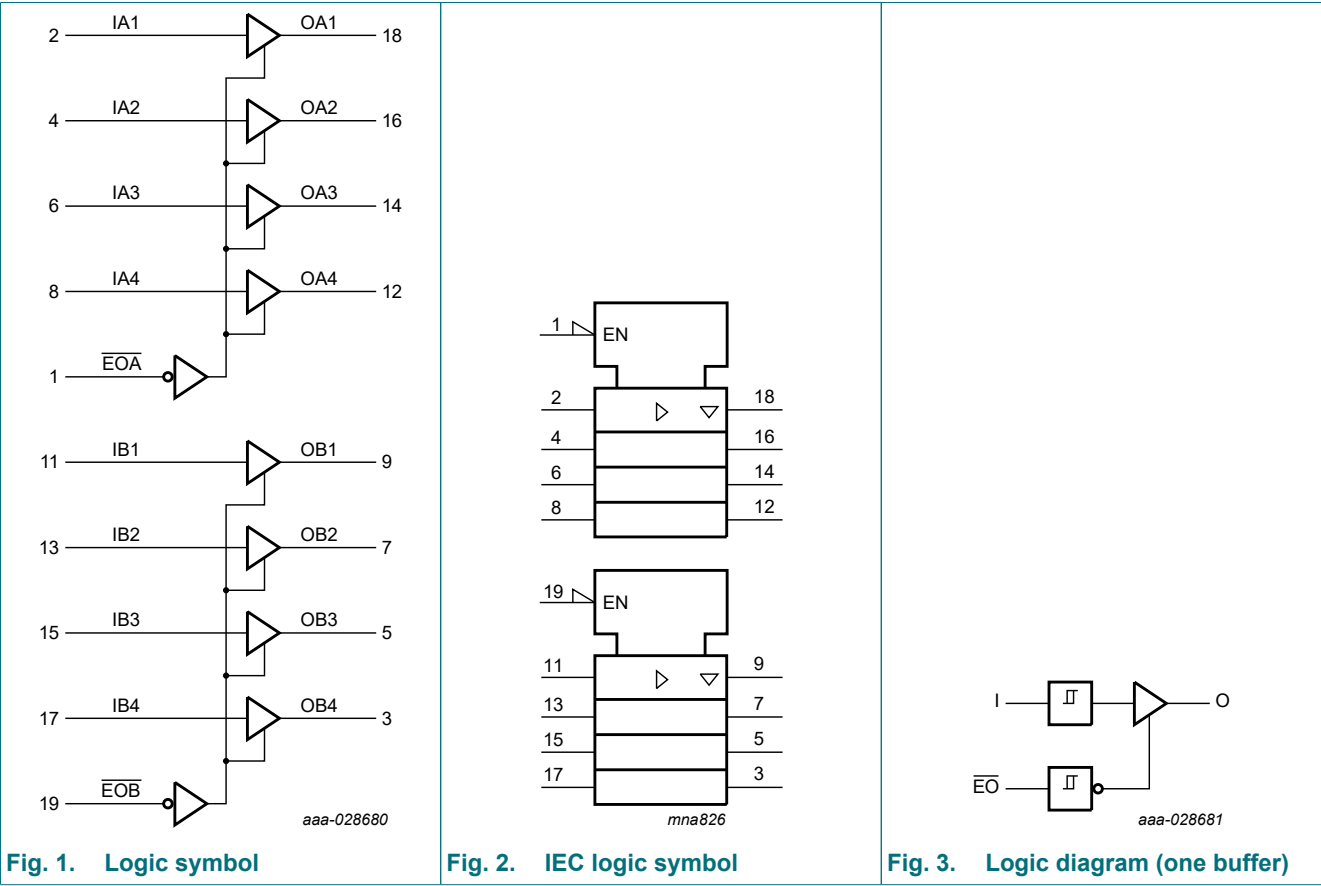
- Wide supply voltage range from 3.0 V to 15.0 V
- CMOS low power dissipation
- High noise immunity
- Complies with JEDEC standard JESD 13-B
- ESD protection
 - HBM: ANSI/ESDA/JEDEC JS-001 class 2 exceeds 2000 V
 - CDM: ANSI/ESDA/JEDEC JS-002 class C3 exceeds 1000 V
- Specified from $-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$

3. Ordering information

Table 1. Ordering information

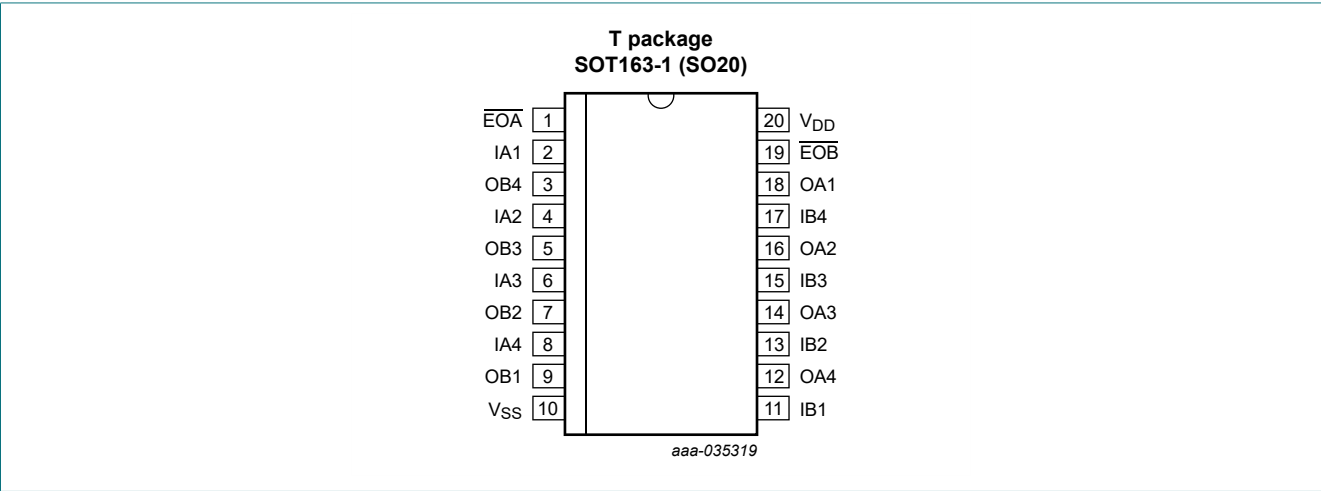
Type number	Package			
	Temperature range	Name	Description	Version
HEF40244BT	$-40\text{ }^{\circ}\text{C}$ to $+85\text{ }^{\circ}\text{C}$	SO20	plastic small outline package; 20 leads; body width 7.5 mm	SOT163-1

4. Functional diagram



5. Pinning information

5.1. Pinning



5.2. Pin description

Table 2. Pin description

Symbol	Pin	Description
EOA, EOB	1, 19	output enable inputs (active low)
IA1, IA2, IA3, IA4	2, 4, 6, 8	data inputs
OA1, OA2, OA3, OA4	18, 16, 14, 12	data outputs
IB1, IB2, IB3, IB4	11, 13, 15, 17	data inputs
OB1, OB2, OB3, OB4	9, 7, 5, 3	data outputs
V _{SS}	10	ground supply voltage
V _{DD}	20	supply voltage

6. Functional description

Table 3. Function table

H = HIGH voltage level; L = LOW voltage level; X = don't care; Z = high-impedance OFF-state.

Control	Input	Output
EOA or EOB	IA _n or IB _n	OAn or OB _n
L	L	L
L	H	H
H	X	Z

7. 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
V _I	input voltage		−0.5	V _{DD} + 0.5	V
I _{DD}	supply current		-	±100	mA
I _{IK}	input clamping current		-	±10	mA
I _{OK}	output clamping current		-	±25	mA
T _{stg}	storage temperature		−65	+150	°C
T _{amb}	ambient temperature		−40	+85	°C
P _{tot}	total power dissipation	T _{amb} = −40 °C to +85 °C	-	500	mW
P	power dissipation	per output	-	100	mW

8. Recommended operating conditions

Table 5. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
V _{DD}	supply voltage	referenced to V _{SS} (usually ground)	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

9. Static characteristics

Table 6. Static characteristics

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

Symbol	Parameter	Conditions		T _{amb} = -40 °C		T _{amb} = 25 °C			T _{amb} = 85 °C		Unit
			V _{DD}	Min	Max	Min	Typ	Max	Min	Max	
V _{IH}	HIGH-level input voltage	I _O < 1 μA									
		V _O = 0.5 V or 4.5 V	5 V	3.5	-	3.5	-	-	3.5	-	V
		V _O = 1.0 V or 9.0 V	10 V	7.0	-	7.0	-	-	7.0	-	V
		V _O = 1.5 V or 13.5 V	15 V	11.0	-	11.0	-	-	11.0	-	V
V _{IL}	LOW-level input voltage	I _O < 1 μA									
		V _O = 0.5 V or 4.5 V	5 V	-	1.5	-	-	1.5	-	1.5	V
		V _O = 1.0 V or 9.0 V	10 V	-	3.0	-	-	3.0	-	3.0	V
		V _O = 1.5 V or 13.5 V	15 V	-	4.0	-	-	4.0	-	4.0	V
V _{OH}	HIGH-level output voltage	I _O < 1 μA	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	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	see Fig. 4 and Fig. 5									
		V _{OH} = 3.6 V	5 V	-9.3	-	-10	-24	-	-10.7	-	mA
		V _{OH} = 4.6 V	5 V	-0.75	-	-0.6	-1.2	-	-0.45	-	mA
		V _{OH} = 8.4 V	10 V	-14.4	-	-15	-46	-	-15	-	mA
		V _{OH} = 9.5 V	10 V	-1.85	-	-1.5	-3.0	-	-1.1	-	mA
		V _{OH} = 13.2 V	15 V	-19.5	-	-20	-62	-	-19.8	-	mA
		V _{OH} = 13.5 V	15 V	-14.5	-	-15	-50	-	-15.5	-	mA
I _{OL}	LOW-level output current	V _{OL} = 0.4 V	5 V	2.9	-	2.3	5.4	-	1.75	-	mA
		V _{OL} = 0.5 V	10 V	9.5	-	7.6	17	-	5.5	-	mA
		V _{OL} = 1.5 V	15 V	30.0	-	25	45	-	19.0	-	mA
I _I	input leakage current	[1]	15 V	-	±0.3	-	-	±0.3	-	±1.0	μA
I _{OZ}	OFF-state output current	V _O = V _{DD}	15 V	-	1.6	-	-	1.6	-	12.0	μA
		V _O = V _{SS}	15 V	-	-1.6	-	-	-1.6	-	-12.0	μA

Symbol	Parameter	Conditions		T _{amb} = -40 °C		T _{amb} = 25 °C			T _{amb} = 85 °C		Unit
			V _{DD}	Min	Max	Min	Typ	Max	Min	Max	
I _{DD}	supply current	I _O = 0 A	5 V	-	4.0	-	-	4.0	-	30	µA
			10 V	-	8.0	-	-	8.0	-	60	µA
			15 V	-	16.0	-	-	16.0	-	120	µA
V _H	hysteresis voltage		5 V	-	-	-	220	-	-	-	mV
			10 V	-	-	-	250	-	-	-	mV
			15 V	-	-	-	320	-	-	-	mV
C _I	input capacitance			-	-	-	7.5	-	-	-	pF

[1] Unused inputs must be connected to V_{DD}, V_{SS} or another input.

10. Dynamic characteristics

Table 7. Dynamic characteristics

V_{SS} = 0 V; T_{amb} = 25 °C; unless otherwise specified; for waveform and test circuit, see Fig. 9.

Symbol	Parameter	Conditions	Extrapolation formula	Min	Typ	Max	Unit
t _{PHL}	HIGH to LOW propagation delay	I _{AN} to O _{AN} ; I _{BN} to O _{BN} ; see Fig. 6. [1]					
		V _{DD} = 5 V	83 ns + (0.24 ns/pF)C _L	-	95	190	ns
		V _{DD} = 10 V	35 ns + (0.10 ns/pF)C _L	-	40	80	ns
		V _{DD} = 15 V	26 ns + (0.07 ns/pF)C _L	-	30	60	ns
t _{PLH}	LOW to HIGH propagation delay	I _{AN} to O _{AN} ; I _{BN} to O _{BN} ; see Fig. 6. [1]					
		V _{DD} = 5 V	82 ns + (0.06 ns/pF)C _L	-	85	170	ns
		V _{DD} = 10 V	38 ns + (0.03 ns/pF)C _L	-	40	80	ns
		V _{DD} = 15 V	29 ns + (0.02 ns/pF)C _L	-	30	60	ns
t _{PZH}	OFF-state to HIGH propagation delay	EO _A to O _{AN} ; EO _B to O _{BN} ; see Fig. 8.					
		V _{DD} = 5 V		-	80	160	ns
		V _{DD} = 10 V		-	35	70	ns
		V _{DD} = 15 V		-	30	60	ns
t _{PZL}	OFF-state to LOW propagation delay	EO _A to O _{AN} ; EO _B to O _{BN} ; see Fig. 8.					
		V _{DD} = 5 V		-	90	180	ns
		V _{DD} = 10 V		-	40	80	ns
		V _{DD} = 15 V		-	30	60	ns
t _{PHZ}	HIGH to OFF-state propagation delay	EO _A to O _{AN} ; EO _B to O _{BN} ; see Fig. 8.					
		V _{DD} = 5 V		-	70	140	ns
		V _{DD} = 10 V		-	35	70	ns
		V _{DD} = 15 V		-	30	60	ns
t _{PLZ}	LOW to OFF-state propagation delay	EO _A to O _{AN} ; EO _B to O _{BN} ; see Fig. 8.					
		V _{DD} = 5 V		-	75	150	ns
		V _{DD} = 10 V		-	40	80	ns
		V _{DD} = 15 V		-	30	60	ns

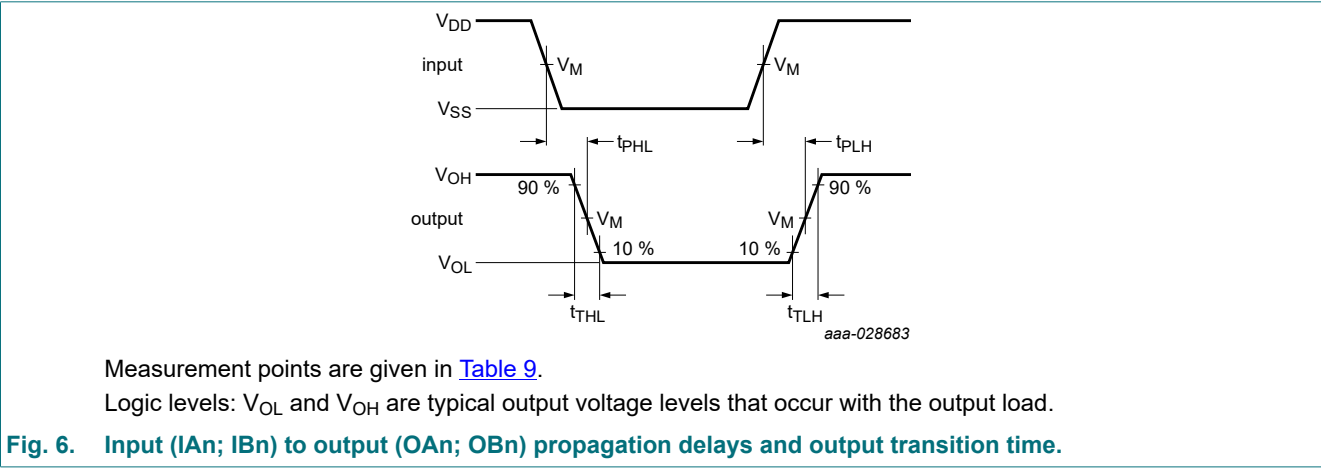
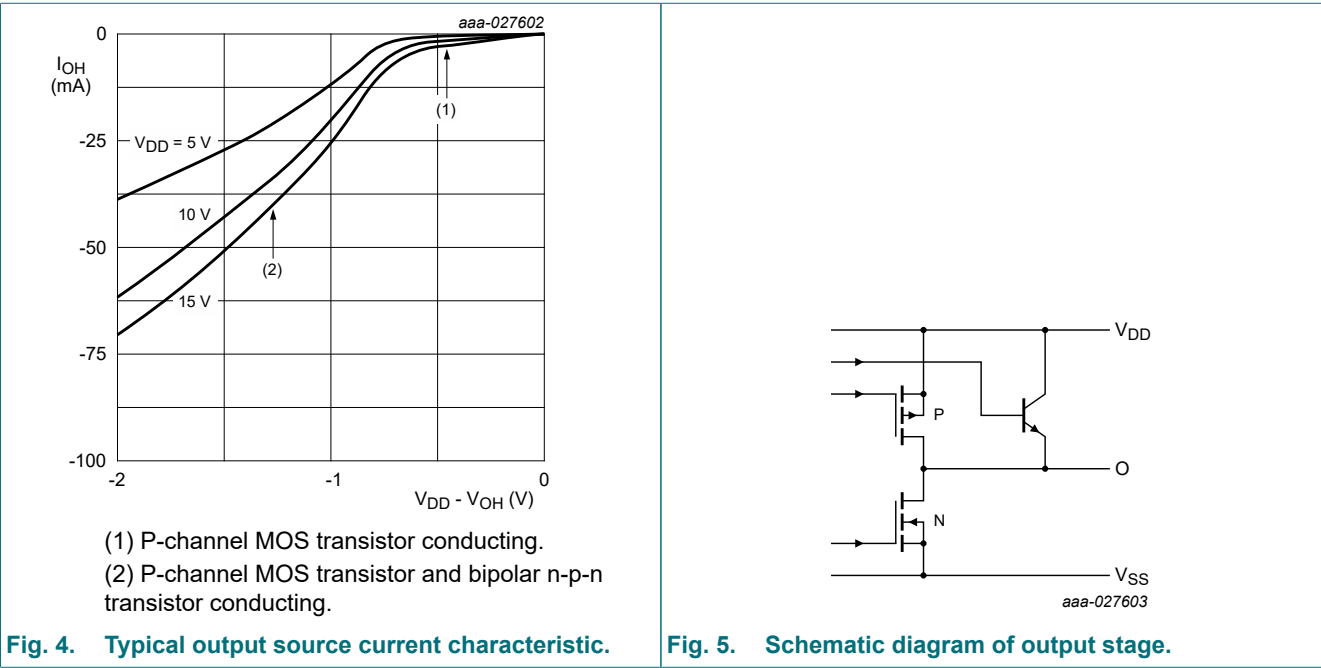
Symbol	Parameter	Conditions	Extrapolation formula	Min	Typ	Max	Unit
t _{THL}	HIGH to LOW output transition time	OAn; OBn; see Fig. 6 and Fig. 7.					
		V _{DD} = 5 V		-	40	80	ns
		V _{DD} = 10 V		-	20	40	ns
		V _{DD} = 15 V		-	15	30	ns
t _{TLH}	LOW to HIGH output transition time	OAn; OBn; see Fig. 6 and Fig. 7.					
		V _{DD} = 5 V		-	30	60	ns
		V _{DD} = 10 V		-	20	40	ns
		V _{DD} = 15 V		-	15	30	ns

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

Table 8. Dynamic power dissipation

Symbol	Parameter	V _{DD}	Typical formula	where:
P _D	dynamic power dissipation	5 V	$P_D = 4250 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ (μW)	f _i = input frequency in MHz; f _o = output frequency in MHz; C _L = output load capacitance in pF; Σ(f _o × C _L) = sum of the outputs; V _{DD} = supply voltage in V.
		10 V	$P_D = 17000 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ (μW)	
		15 V	$P_D = 46000 \times f_i + \Sigma(f_o \times C_L) \times V_{DD}^2$ (μW)	

10.1. Waveforms and test circuit



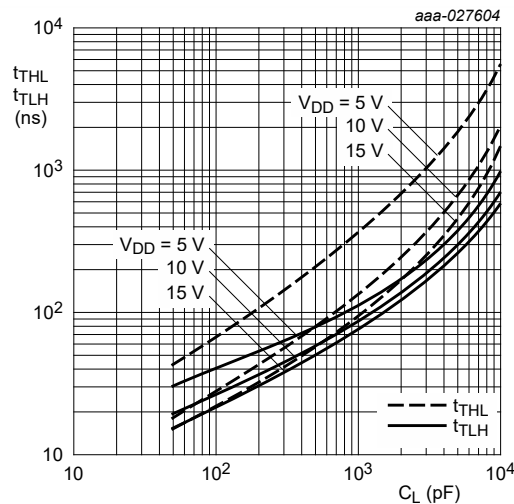
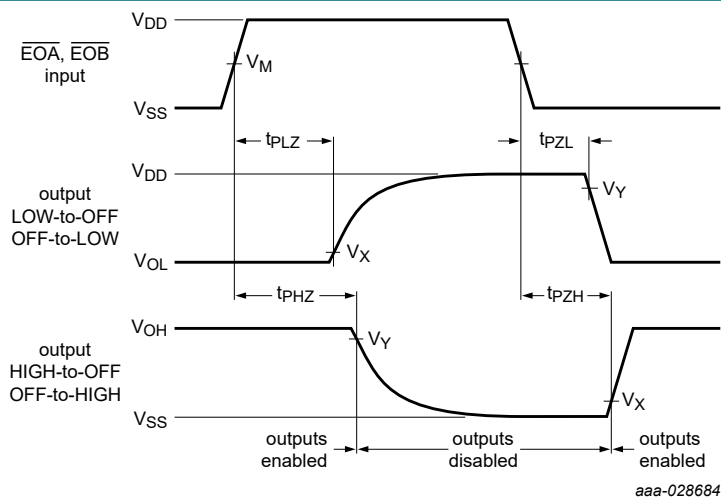


Fig. 7. Output transition times as a function of the load capacitance



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. 8. 3-state enable and disable times

Table 9. Measurement points

Supply voltage	Input	Output		
V_{DD}	V_M	V_M	V_X	V_Y
5 V to 15 V	$0.5 \times V_{DD}$	$0.5 \times V_{DD}$	$0.1 \times V_{DD}$	$0.9 \times V_{DD}$

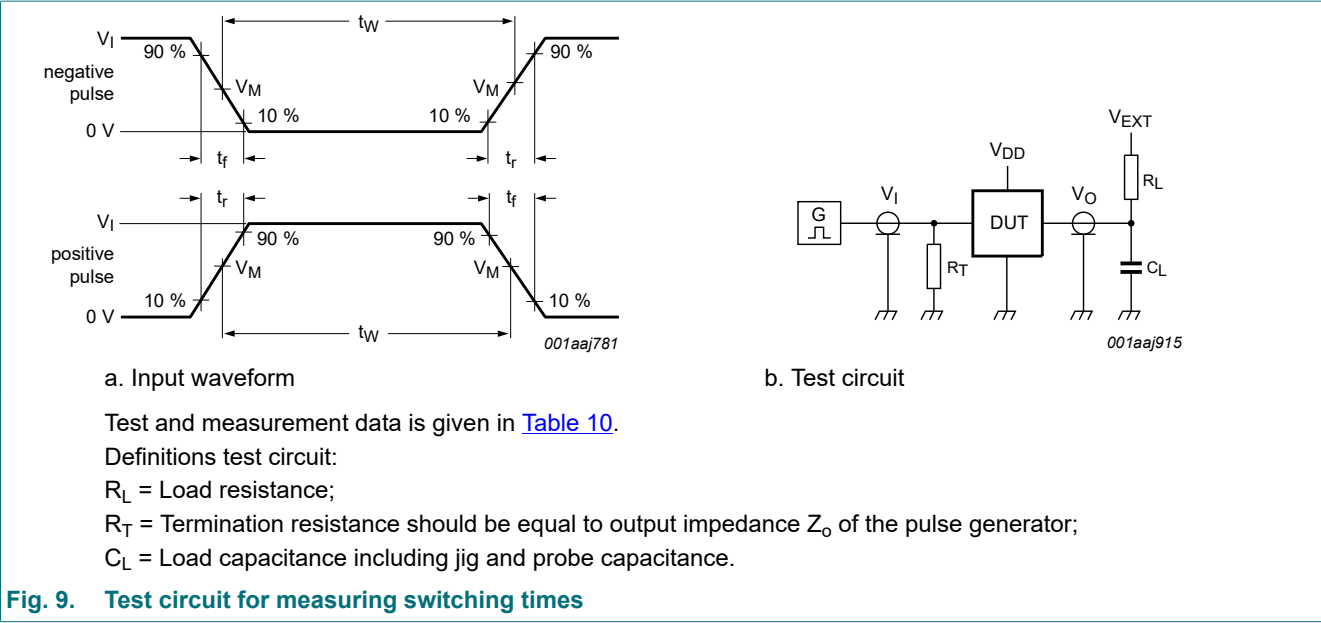


Table 10. Test data

Supply voltage	Input		Load		V _{EXT}		
V _{DD}	V _I	t _r , t _f	C _L	R _L	t _{PLH} , t _{PHL}	t _{PHZ} , t _{PZH}	t _{PLZ} , t _{PZL}
5 V to 15 V	V _{DD}	≤ 20 ns	50 pF	1 kΩ	open	V _{SS}	V _{DD}

11. Package outline

SO20: plastic small outline package; 20 leads; body width 7.5 mm

SOT163-1



Fig. 10. Package outline SOT163-1 (SO20)

12. Abbreviations

Table 11. Abbreviations

Acronym	Description
ANSI	American National Standards Institute
CDM	Charged Device Model
CMOS	Complementary Metal-Oxide Semiconductor
DUT	Device Under Test
ESD	ElectroStatic Discharge
ESDA	ElectroStatic Discharge Association
HBM	Human Body Model
JEDEC	Joint Electron Device Engineering Council

13. Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
HEF40244B v.6	20240808	Product data sheet	-	HEF40244B v.5
Modifications:	• Section 2: ESD specification updated according to the latest JEDEC standard.			
HEF40244B v.5	20231020	Product data sheet	-	HEF40244B v.4
Modifications:	• Section 1 and Section 2 updated. • Section 7: Derating values for P_{tot} total power dissipation removed.			
HEF40244B v.4	20180629	Product data sheet	-	HEF40244B v.3
Modifications:	• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia. • Legal texts have been adapted to the new company name where appropriate.			
HEF40244B v.3	19950101	Product specification	-	HEF40244B v.2
HEF40244B v.2	19950101	Product specification	-	HEF40244B v.1

14. Legal information

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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