

DATA SHEET

74F244/74F244B Octal buffers (3-State)

Product specification

1994 Dec 05

IC15 Data Handbook

Philips Semiconductors



PHILIPS

Octal buffers (3-State)

74F244/74F244B

FEATURES

- Octal bus interface
- 3-State output buffer sink 64mA
- 15mA source current
- Guaranteed output skew less than 2.0ns (74F244B)
- Reduced ground bounce (74F244B)
- Reduced I_{CC} (74F244B)
- Reduced loading (74F244B I_{IL} = 40µA)
- Split lead frame offers increased noise immunity (74F244B)
- Industrial temperature range available (-40°C to +85°C) for 74F244
- 74F244 available in SSOP Type II package

DESCRIPTION

The 74F244 is an octal buffer that is ideal for driving bus lines of buffer memory address registers. The outputs are all capable of sinking 64mA and sourcing up to 15mA, producing very good capacitive drive characteristics. The device features two output enables, $\overline{OE}a$ and $\overline{OE}b$, each controlling four of the 3-State outputs.

The 74F244B is functionally equivalent to the 74F244. It has been designed to reduce effects of ground noise. Other advantages are noted in the features.

TYPE	TYPICAL PROPAGATION DELAY	TYPICAL SUPPLY CURRENT (TOTAL)
74F244	4.0ns	53mA
74F244B	4.0ns	33mA

ORDERING INFORMATION

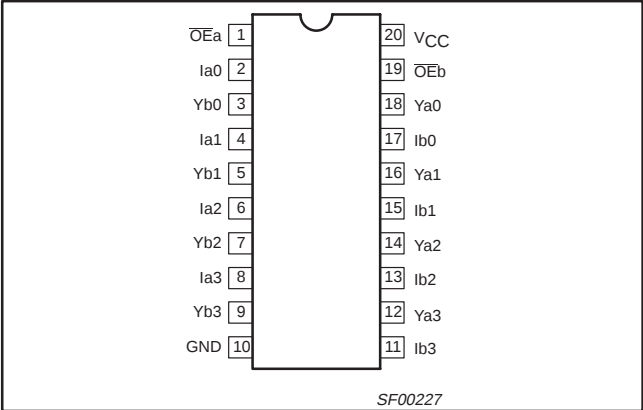
DESCRIPTION	ORDER CODE		PKG DWG #
	COMMERCIAL RANGE V _{CC} = 5V ±10%, T _{amb} = 0°C to +70°C	INDUSTRIAL RANGE V _{CC} = 5V ±10%, T _{amb} = -40°C to +85°C	
20-pin plastic DIP	N74F244N, N74F244BN	I74F244N	SOT146-1
20-pin plastic SOL	N74F244D, N74F244BD	I74F244D	SOT163-1
20-pin plastic SSOP II	N74F244DB		SOT339-1

INPUT AND OUTPUT LOADING AND FAN OUT TABLE

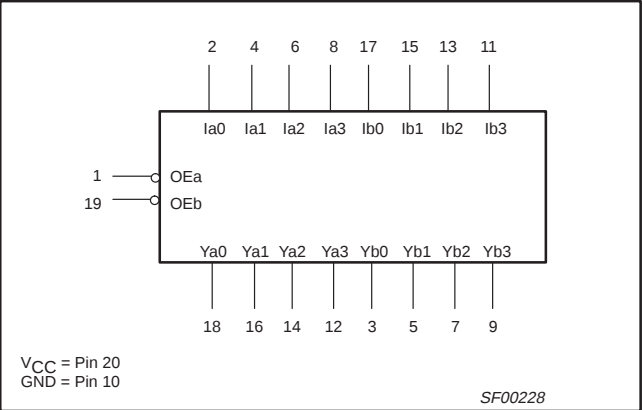
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW
I _{an} , I _{bn}	Data inputs (74F244)	1.0/2.67	20µA/1.6mA
	Data inputs (74F244B)	1.0/0.067	20µA/40µA
$\overline{OE}a$, $\overline{OE}b$	Output enable inputs (active low) (74F244)	1.0/1.67	20µA/1.0mA
	Output enable inputs (active low) (74F244B)	1.0/0.067	20µA/40µA
Y _{an} , Y _{bn}	Data outputs	750/106.7	15mA/64mA

NOTE: One (1.0) FAST unit load is defined as: 20µA in the high state and 0.6mA in the low state.

PIN CONFIGURATION



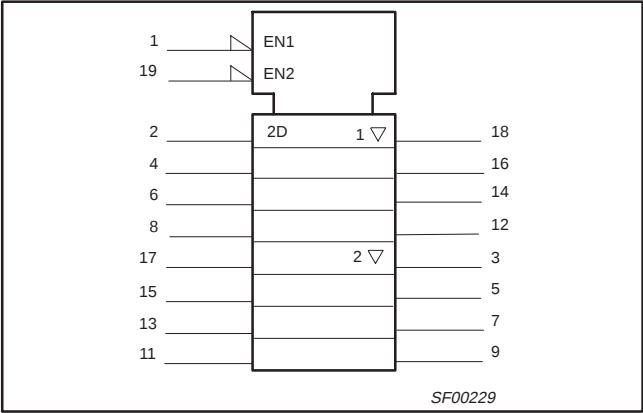
LOGIC SYMBOL



Octal buffers (3-State)

74F244/74F244B

IEC/IEEE SYMBOL

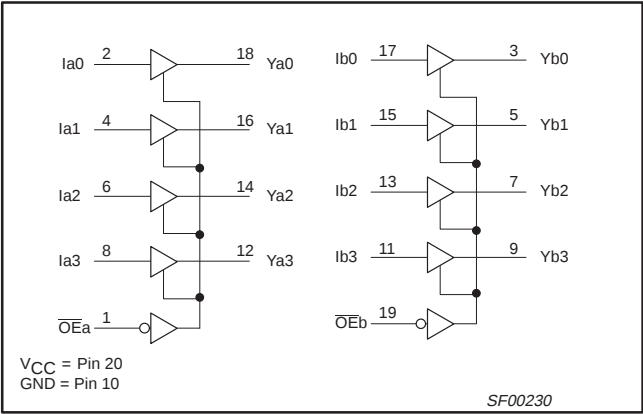


FUNCTION TABLE

INPUTS				OUTPUTS	
$\overline{OE}a$	Ia	$\overline{OE}b$	Ib	Ya	Yb
L	L	L	L	L	L
L	H	L	H	H	H
H	X	H	X	Z	Z

NOTES:
H = High voltage level
L = Low voltage level
X = Don't care
Z = High impedance "off" state

LOGIC DIAGRAM



Octal buffers (3-State)

74F244/74F244B

ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limit set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free air temperature range.)

SYMBOL	PARAMETER		RATING	UNIT
V_{CC}	Supply voltage		-0.5 to +7.0	V
V_{IN}	Input voltage		-0.5 to +7.0	V
I_{IN}	Input current		-30 to +5	mA
V_{OUT}	Voltage applied to output in high output state		-0.5 to V_{CC}	V
I_{OUT}	Current applied to output in low output state		128	mA
T_{amb}	Operating free air temperature range	Commercial range	0 to +70	°C
		Industrial range (74F244 only)	-40 to +85	°C
T_{stg}	Storage temperature range		-65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER		LIMITS			UNIT
			MIN	NOM	MAX	
V_{CC}	Supply voltage		4.5	5.0	5.5	V
V_{IN}	High-level input voltage		2.0			V
V_{IL}	Low-level input voltage				0.8	V
I_{IK}	Input clamp current				-18	mA
I_{OH}	High-level output current				-15	mA
i_{OL}	Low-level output current				64	mA
T_{amb}	Operating free air temperature range	Commercial range	0		+70	°C
		Industrial range (74F244 only)	-40		+85	°C

Octal buffers (3-State)

74F244/74F244B

DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER			TEST CONDITIONS ¹			LIMITS			UNIT
							MIN	TYP ²	MAX	
V _{OH}	High-level output voltage			V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN	I _{OH} = -3mA	±10%V _{CC}	2.5			V
						±5%V _{CC}	2.7	3.4		V
				I _{OH} = -15mA	±10%V _{CC}	2.0			V	
					±5%V _{CC}	2.0			V	
V _{OL}	Low-level output voltage			V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN,	I _{OL} = MAX	±10%V _{CC}			0.55	V
						±5%V _{CC}		0.42	0.55	V
V _{IK}	Input clamp voltage			V _{CC} = MIN, I _I = I _{IK}				-0.73	-1.2	V
I _I	Input current at maximum input voltage			V _{CC} = MAX, V _I = 7.0V					100	μA
I _{IH}	High-level input current			V _{CC} = MAX, V _I = 2.7V					20	μA
I _{IL}	Low-level input current	74F244 $\overline{OE}a$, $\overline{OE}b$	V _{CC} = MAX, V _I = 0.5V					-1.0	mA	
		74F244 I _{an} , I _{bn}						-1.6	mA	
		74F244B all inputs						-40	μA	
I _{OZH}	Off-state output current, high-level voltage applied			V _{CC} = MAX, V _O = 2.7V					50	μA
I _{OZL}	Off-state output current, low-level voltage applied			V _{CC} = MAX, V _O = 0.5V					-50	μA
I _{OS}	Short-circuit output current ³			V _{CC} = MAX			-100		-225	mA
I _{CC}	Supply current (total)	74F244	I _{CCH}	V _{CC} = MAX				40	60	mA
			I _{CCL}					60	90	mA
			I _{CCZ}					60	90	mA
		74F244B	I _{CCH}	V _{CC} = MAX				20	30	mA
			I _{CCL}					50	70	mA
			I _{CCZ}					29	40	mA

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
- Not more than one output should be shorted at a time. For testing I_{OS}, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a high output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

Octal buffers (3-State)

74F244/74F244B

AC ELECTRICAL CHARACTERISTICS FOR 74F244

SYMBOL	PARAMETER	TEST CONDITION	A PORT LIMITS								UNIT
			T _{amb} = +25°C V _{CC} = +5.0V C _L = 50pF, R _L = 500Ω			T _{amb} = 0°C to +70°C V _{CC} = +5.0V ± 10% C _L = 50pF, R _L = 500Ω		T _{amb} = -40°C to +85°C V _{CC} = +5.0V ± 10% C _L = 50pF, R _L = 500Ω			
			MIN	TYP	MAX	MIN	MAX	MIN	MAX		
t _{PLH} t _{PHL}	Propagation delay I _{an} , I _{bn} to Y _n	Waveform 1	2.5 2.5	4.0 4.0	5.2 5.2	2.0 2.0	6.2 6.5	1.5 2.0	7.0 7.0	ns	
t _{PZH} t _{PZL}	Output enable time to high or low	Waveform 2 Waveform 4	2.0 2.0	4.3 5.0	5.7 7.0	2.0 2.0	6.7 8.0	2.0 2.0	8.0 8.5	ns	
t _{PHZ} t _{PLZ}	Output disable time from high or low	Waveform 2 Waveform 4	1.5 1.5	2.5 2.5	5.5 5.5	1.0 1.0	6.0 5.5	1.0 1.0	6.0 5.5	ns	

AC ELECTRICAL CHARACTERISTICS FOR 74F244B

SYMBOL	PARAMETER	TEST CONDITION	LIMITS						UNIT
			T _{amb} = +25°C V _{CC} = +5.0V C _L = 50pF, R _L = 500Ω			T _{amb} = 0°C to +70°C V _{CC} = +5.0V ± 10% C _L = 50pF, R _L = 500Ω			
			MIN	TYP	MAX	MIN	MAX		
t _{PLH} t _{PHL}	Propagation delay I _{an} , I _{bn} to Y _n	Waveform 1	2.5 2.5	4.5 4.5	5.7 6.0	2.0 2.5	6.2 6.5	ns	
t _{PZH} t _{PZL}	Output enable time to high or low level	Waveform 2 Waveform 4	2.0 3.0	4.0 5.5	6.0 7.5	2.0 3.0	6.5 8.0	ns	
t _{PHZ} t _{PLZ}	Output disable time from high or low level	Waveform 2 Waveform 4	1.5 1.5	2.5 2.5	5.5 5.5	1.0 1.0	6.0 5.5	ns	
t _{sk(0)}	Output skew ^{1, 2}	Waveform 3			1.5		2.0	ns	

NOTES:

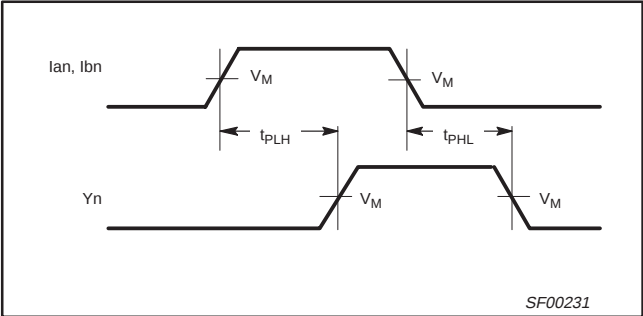
- $|t_{pN} \text{ actual} - t_{pM} \text{ actual}|$ for any output compared to any other output where N and M are either LH or HL.
- Skew times are valid only under same test conditions (temperature, V_{CC} , loading, etc.).

Octal buffers (3-State)

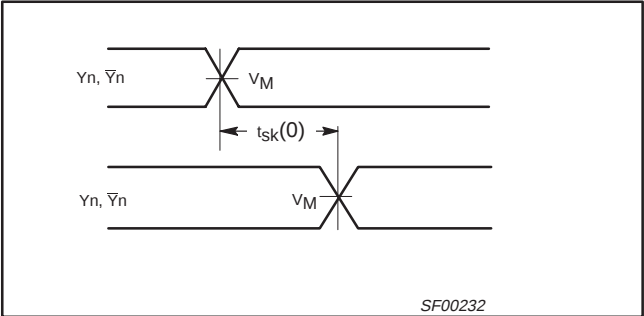
74F244/74F244B

AC WAVEFORMS

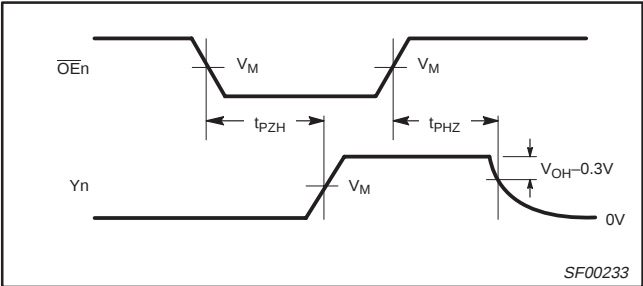
For all waveforms, $V_M = 1.5V$.



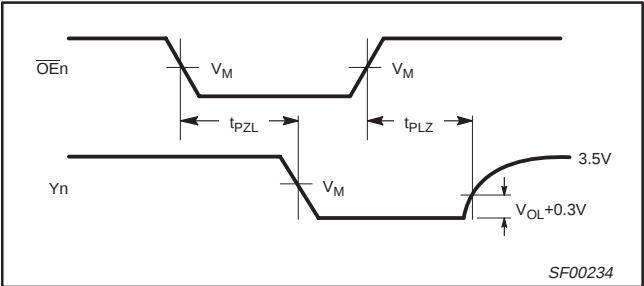
Waveform 1. Propagation Delay for data to outputs



Waveform 3. Output skew



Waveform 2. 3-State output enable time to high level and output disable time from high level



Waveform 4. 3-State output enable time to low level and output disable time from low level

TEST CIRCUIT AND WAVEFORMS

SWITCH POSITION	
TEST	SWITCH
t_{PLZ} , t_{PZL}	closed
All other	open

PULSE GENERATOR

V_{IN}

D.U.T.

V_{OUT}

R_T

C_L

R_L

V_{CC}

7.0V

Test circuit for 3-State outputs

DEFINITIONS:
 R_L = Load resistor; see AC electrical characteristics for value.
 C_L = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value
 R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

NEGATIVE PULSE

POSITIVE PULSE

t_w

$t_{THL}(t_f)$

$t_{TLH}(t_r)$

90%

10%

90%

10%

AMP (V)

0V

Input pulse definition

family	INPUT PULSE REQUIREMENTS					
	amplitude	V_M	rep. rate	t_w	t_{TLH}	t_{THL}
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns

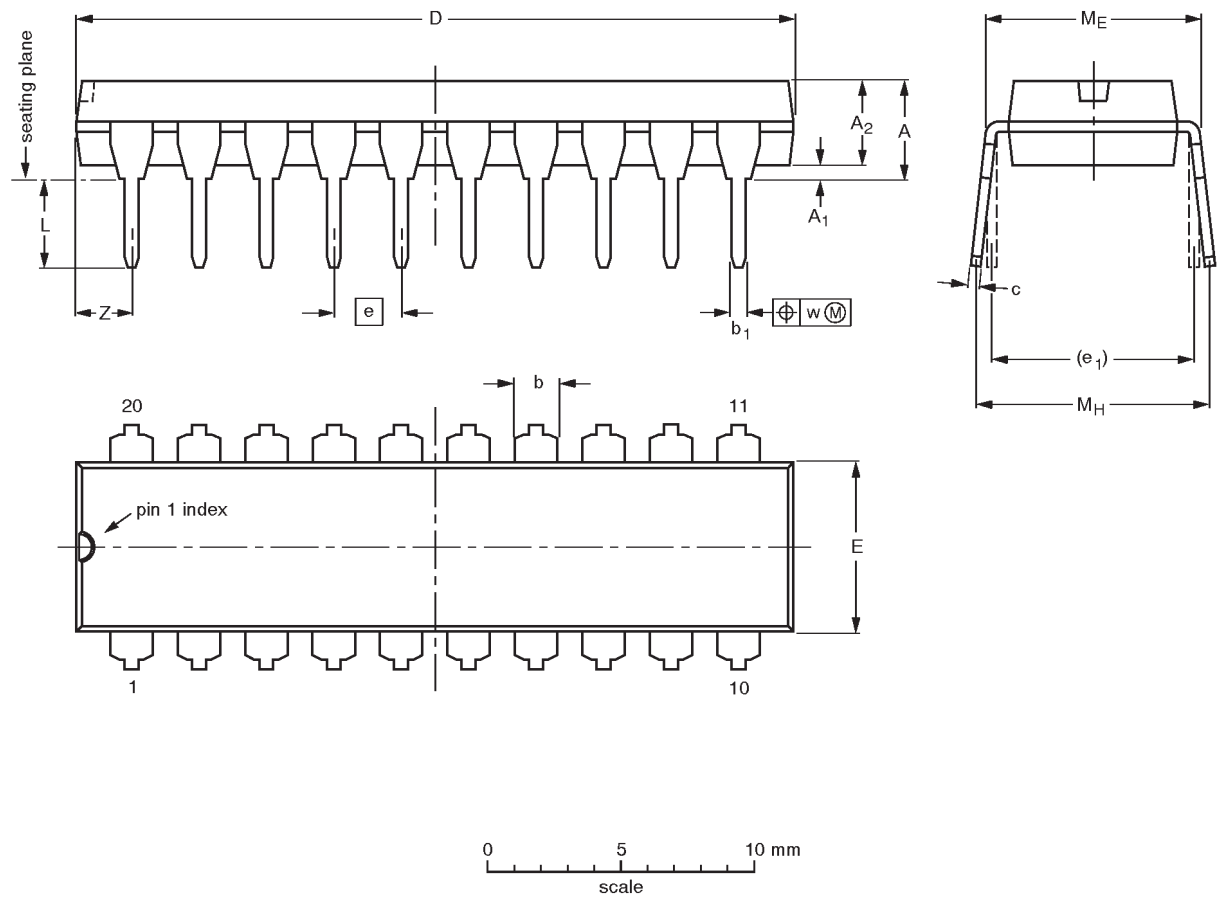
SF000235

Octal buffers (3-State)

74F244/74F244B

DIP20: plastic dual in-line package; 20 leads (300 mil)

SOT146-1



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

UNIT	A max.	A ₁ min.	A ₂ max.	b	b ₁	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	0.36 0.23	26.92 26.54	6.40 6.22	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.0
inches	0.17	0.020	0.13	0.068 0.051	0.021 0.015	0.014 0.009	1.060 1.045	0.25 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.078

Note
1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

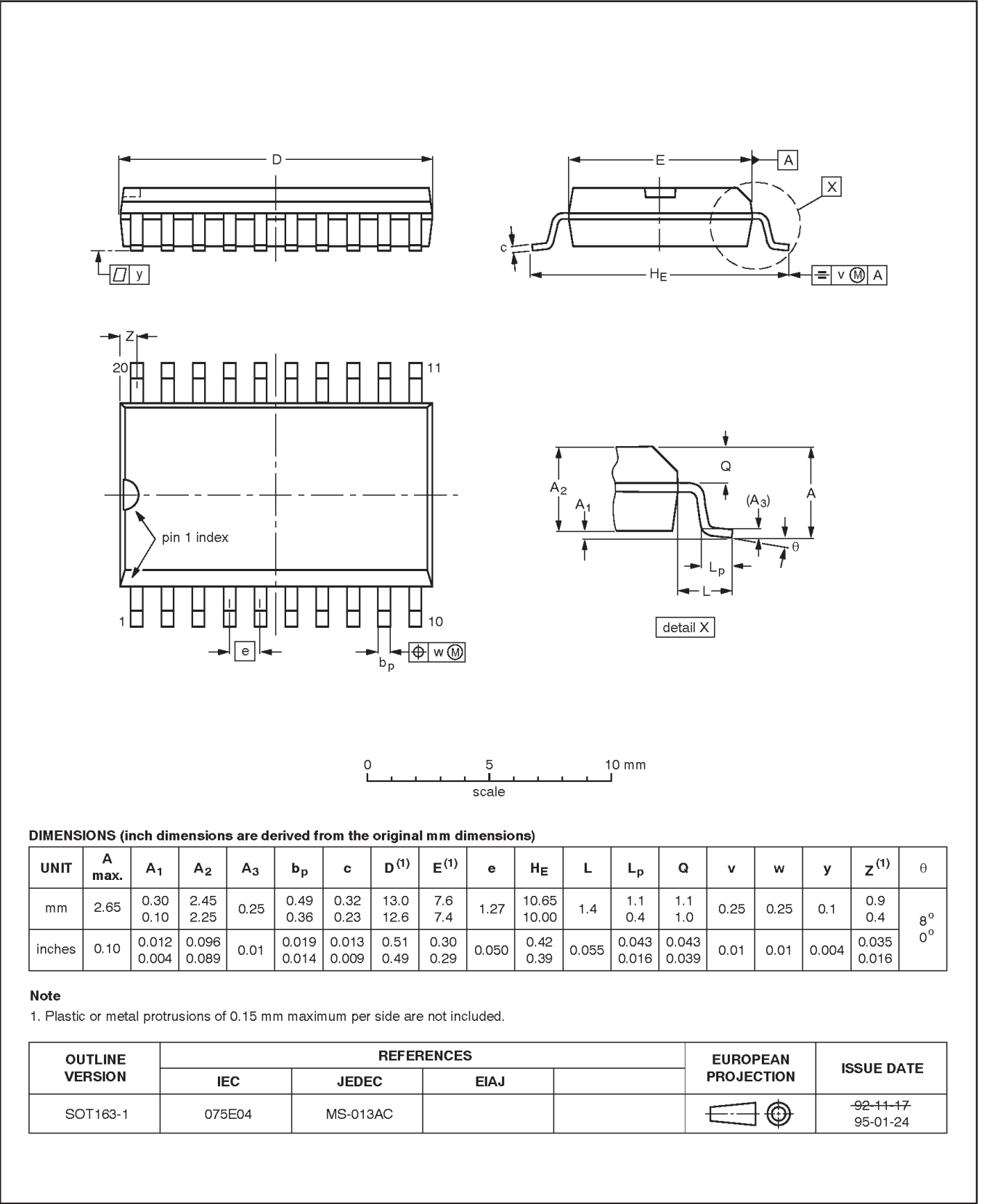
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT146-1			SC603			92-11-17 95-05-24

Octal buffers (3-State)

74F244/74F244B

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

SOT163-1

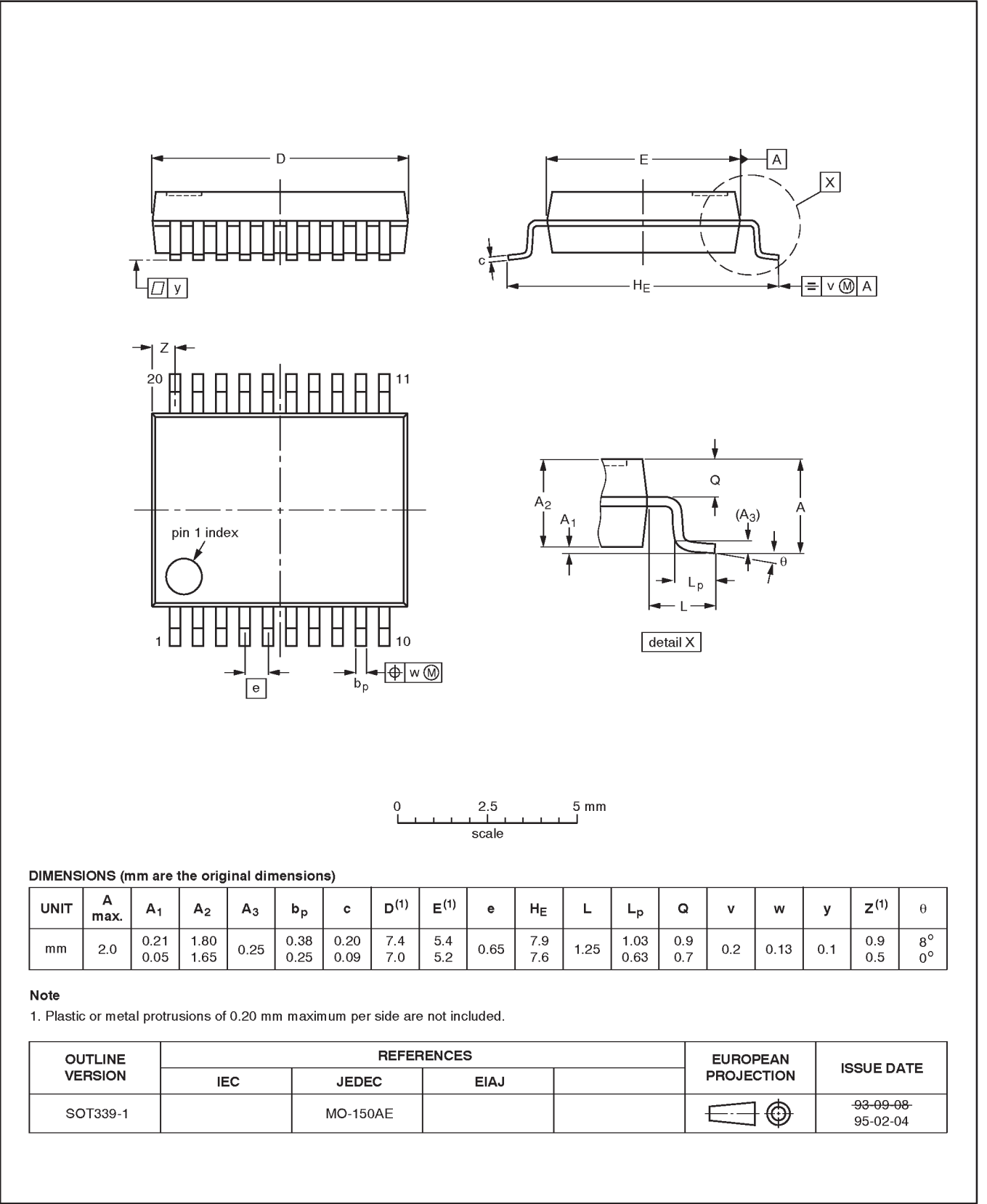


Octal buffers (3-State)

74F244/74F244B

SSOP20: plastic shrink small outline package; 20 leads; body width 5.3 mm

SOT339-1



Octal buffers (3-State)

74F244/74F244B

NOTES

Octal buffers (3-State)

74F244/74F244B

DEFINITIONS		
Data Sheet Identification	Product Status	Definition
Objective Specification	Formative or in Design	This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice.
Preliminary Specification	Preproduction Product	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.
Product Specification	Full Production	This data sheet contains Final Specifications. Philips Semiconductors reserves the right to make changes at any time without notice, in order to improve design and supply the best possible product.

9397-750-05103

Philips Semiconductors and Philips Electronics North America Corporation reserve the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified. Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

LIFE SUPPORT APPLICATIONS
Philips Semiconductors and Philips Electronics North America Corporation Products are not designed for use in life support appliances, devices, or systems where malfunction of a Philips Semiconductors and Philips Electronics North America Corporation Product can reasonably be expected to result in a personal injury. Philips Semiconductors and Philips Electronics North America Corporation customers using or selling Philips Semiconductors and Philips Electronics North America Corporation Products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors and Philips Electronics North America Corporation for any damages resulting from such improper use or sale.