

# DATA SHEET

**74ABT2241**

Octal buffer with  $30\Omega$  series termination  
resistors; (3-State)

Product specification

1996 Sep 30

IC23 Data Handbook

# Octal buffer with 30Ω series termination resistors (3-State)

74ABT2241

## FEATURES

- Octal bus interface
- 3-State buffers
- Power-up 3-State
- Output capability: +12mA/-32mA
- Latch-up protection exceeds 500mA per Jedec Std 17
- ESD protection exceeds 2000 V per MIL STD 883 Method 3015 and 200 V per Machine Model

## DESCRIPTION

The 74ABT2241 high-performance BiCMOS device combines low static and dynamic power dissipation with high speed and high output drive.

The 74ABT2241 device is an octal buffer that is ideal for driving bus lines. The device features two Output Enables (1OE, 2OE), each controlling four of the 3-State outputs.

The 74ABT2241 is designed with 30Ω series resistance in both the High and Low states of the output. The design reduces line noise in applications such as memory address drivers, clock drivers, and bus receivers/transceivers.

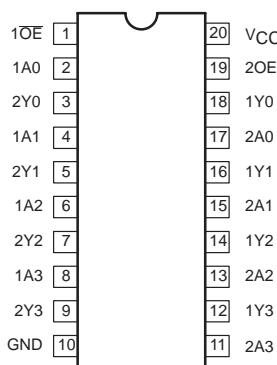
## QUICK REFERENCE DATA

SYMBOL	PARAMETER	CONDITIONS $T_{amb} = 25^\circ C$ ; GND = 0V	TYPICAL	UNIT
$t_{PLH}$ $t_{PHL}$	Propagation delay An to Yn	$C_L = 50\text{pF}$ ; $V_{CC} = 5\text{V}$	2.9	ns
$C_{IN}$	Input capacitance	$V_I = 0\text{V}$ or $V_{CC}$	3	pF
$C_{OUT}$	Output capacitance	Outputs disabled; $V_O = 0\text{V}$ or $V_{CC}$	7	pF
$I_{CCZ}$	Total supply current	Outputs disabled; $V_{CC} = 5.5\text{V}$	50	$\mu\text{A}$

## ORDERING INFORMATION

PACKAGES	TEMPERATURE RANGE	OUTSIDE NORTH AMERICA	NORTH AMERICA	DWG NUMBER
20-Pin Plastic DIP	−40°C to +85°C	74ABT2241 N	74ABT2241 N	SOT146-1
20-Pin plastic SO	−40°C to +85°C	74ABT2241 D	74ABT2241 D	SOT163-1
20-Pin Plastic SSOP Type II	−40°C to +85°C	74ABT2241 DB	74ABT2241 DB	SOT339-1
20-Pin Plastic TSSOP Type I	−40°C to +85°C	74ABT2241 PW	7ABT2241PW DH	SOT360-1

## PIN CONFIGURATION



SA00038

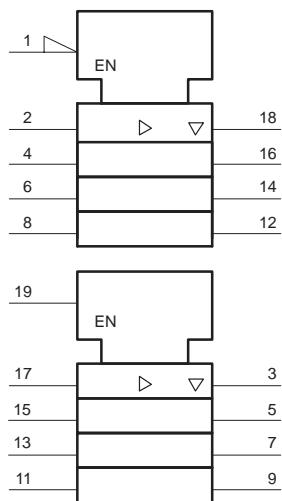
## PIN DESCRIPTION

PIN NUMBER	SYMBOL	NAME AND FUNCTION
2, 4, 6, 8	1A0 – 1A3	Data inputs
17, 15, 13, 11	2A0 – 2A3	Data inputs
18, 16, 14, 12	1Y0 – 1Y3	Data outputs
3, 5, 7, 9	2Y0 – 2Y3	Data outputs
1, 19	1OE, 2OE	Output enables
10	GND	Ground (0V)
20	V <sub>CC</sub>	Positive supply voltage

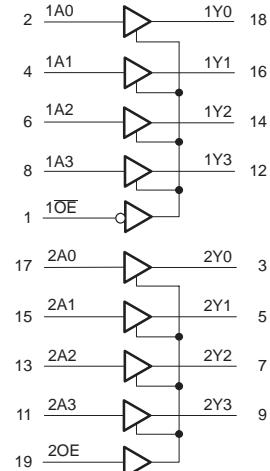
# Octal buffer with 30Ω series termination resistors (3-State)

74ABT2241

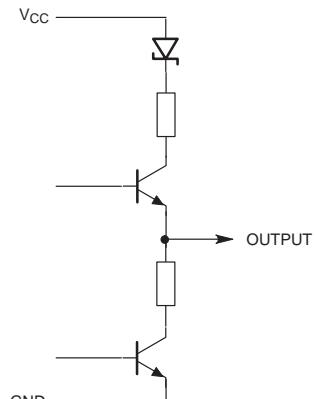
## LOGIC SYMBOL (IEEE/IEC)



## LOGIC SYMBOL



## SCHEMATIC OF EACH OUTPUT



## FUNCTION TABLE

INPUTS				OUTPUTS	
1OE	1An	2OE	2An	1Yn	2Yn
L	L	H	L	L	L
L	H	H	H	H	H
H	X	L	X	Z	Z

H = High voltage level

L = Low voltage level

X = Don't care

Z = High impedance "off" state

## ABSOLUTE MAXIMUM RATINGS<sup>1,2</sup>

SYMBOL	PARAMETER	CONDITIONS	RATING	UNIT
V <sub>CC</sub>	DC supply voltage		-0.5 to +7.0	V
I <sub>IK</sub>	DC input diode current	V <sub>I</sub> < 0	-18	mA
V <sub>I</sub>	DC input voltage <sup>3</sup>		-1.2 to +7.0	V
I <sub>OK</sub>	DC output diode current	V <sub>O</sub> < 0	-50	mA
V <sub>OUT</sub>	DC output voltage <sup>3</sup>	output in Off or High state	-0.5 to +5.5	V
I <sub>OUT</sub>	DC output current	output in Low state	128	mA
T <sub>stg</sub>	Storage temperature range		-65 to 150	°C

### NOTES:

1. Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under "recommended operating conditions" is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

# Octal buffer with $30\Omega$ series termination resistors (3-State)

74ABT2241

## RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER	LIMITS		UNIT
		Min	Max	
$V_{CC}$	DC supply voltage	4.5	5.5	V
$V_I$	Input voltage	0	$V_{CC}$	V
$V_{IH}$	High-level input voltage	2.0		V
$V_{IL}$	Low-level Input voltage		0.8	V
$I_{OH}$	High-level output current		-32	mA
$I_{OL}$	Low-level output current		12	mA
$\Delta t/\Delta v$	Input transition rise or fall rate	0	5	ns/V
$T_{amb}$	Operating free-air temperature range	-40	+85	°C

## DC ELECTRICAL CHARACTERISTICS

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS			UNIT	
			$T_{amb} = +25^\circ C$		$T_{amb} = -40^\circ C$ to $+85^\circ C$		
			Min	Typ	Max		
$V_{IK}$	Input clamp voltage	$V_{CC} = 4.5V$ ; $I_{IK} = -18mA$		-0.9	-1.2		V
$V_{OH}$	High-level output voltage	$V_{CC} = 4.5V$ ; $I_{OH} = -3mA$ ; $V_I = V_{IL}$ or $V_{IH}$	2.5	2.9		2.5	V
		$V_{CC} = 5.0V$ ; $I_{OH} = -3mA$ ; $V_I = V_{IL}$ or $V_{IH}$	3.0	3.4		3.0	V
		$V_{CC} = 4.5V$ ; $I_{OH} = -32mA$ ; $V_I = V_{IL}$ or $V_{IH}$	2.0	2.4		2.0	V
$V_{OL}$	Low-level output voltage	$V_{CC} = 4.5V$ ; $I_{OL} = 5mA$ ; $V_I = V_{IL}$ or $V_{IH}$		0.32	0.55		V
		$V_{CC} = 4.5V$ ; $I_{OL} = 12mA$ ; $V_I = V_{IL}$ or $V_{IH}$			0.8		V
$I_I$	Input leakage current	$V_{CC} = 5.5V$ ; $V_I = GND$ or $5.5V$		$\pm 0.01$	$\pm 1.0$		$\mu A$
$I_{OFF}$	Power-off leakage current	$V_{CC} = 0.0V$ ; $V_I$ or $V_O \leq 4.5V$		$\pm 5.0$	$\pm 100$		$\mu A$
$I_{PU}/I_{PD}$	Power-up/down 3-State output current <sup>3</sup>	$V_{CC} = 2.0V$ ; $V_O = 0.5V$ ; $V_I = GND$ or $V_{CC}$ ; $V_{OE} = V_{CC}$ ; $V_{OE} = GND$		$\pm 5.0$	$\pm 50$		$\mu A$
$I_{OZH}$	3-State output High current	$V_{CC} = 5.5V$ ; $V_O = 2.7V$ ; $V_I = V_{IL}$ or $V_{IH}$		5.0	50		$\mu A$
$I_{OZL}$	3-State output Low current	$V_{CC} = 5.5V$ ; $V_O = 0.5V$ ; $V_I = V_{IL}$ or $V_{IH}$		-5.0	-50		$\mu A$
$I_{CEX}$	Output High leakage current	$V_{CC} = 5.5V$ ; $V_O = 5.5V$ ; $V_I = GND$ or $V_{CC}$		5.0	50		$\mu A$
$I_O$	Output current <sup>1</sup>	$V_{CC} = 5.5V$ ; $V_O = 2.5V$	-50	-100	-180	-50	$mA$
$I_{CCH}$	Quiescent supply current	$V_{CC} = 5.5V$ ; Outputs High, $V_I = GND$ or $V_{CC}$		50	250		$\mu A$
$I_{CCL}$		$V_{CC} = 5.5V$ ; Outputs Low, $V_I = GND$ or $V_{CC}$		24	30		$mA$
$I_{CCZ}$		$V_{CC} = 5.5V$ ; Outputs 3-State; $V_I = GND$ or $V_{CC}$		50	250		$\mu A$
$\Delta I_{CC}$	Additional supply current per input pin <sup>2</sup>	Outputs enabled, one input at 3.4V, other inputs at $V_{CC}$ or GND; $V_{CC} = 5.5V$		0.5	1.5		$mA$
		Outputs 3-State, one data input at 3.4V, other inputs at $V_{CC}$ or GND; $V_{CC} = 5.5V$		50	250		$\mu A$
		Outputs 3-State, one enable input at 3.4V, other inputs at $V_{CC}$ or GND; $V_{CC} = 5.5V$		0.5	1.5		$mA$

NOTES:

# Octal buffer with $30\Omega$ series termination resistors (3-State)

74ABT2241

1. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
2. This is the increase in supply current for each input at 3.4V.
3. This parameter is valid for any  $V_{CC}$  between 0V and 2.1V with a transition time of up to 10msec. For  $V_{CC} = 2.1V$  to  $V_{CC} = 5V \pm 10\%$ , a transition time of up to 100  $\mu$ sec is permitted.

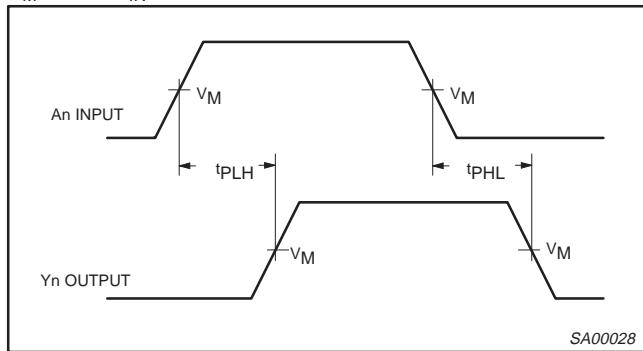
## AC CHARACTERISTICS

$GND = 0V$ ;  $t_R = t_F = 2.5\text{ns}$ ;  $C_L = 50\text{pF}$ ,  $R_L = 500\Omega$

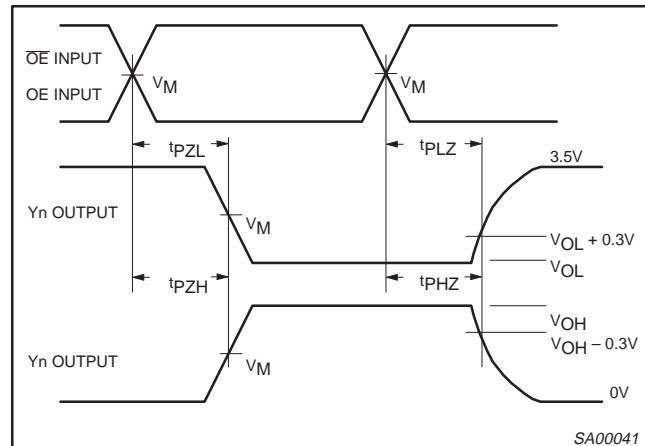
SYMBOL	PARAMETER	WAVEFORM	LIMITS					UNIT	
			$T_{amb} = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$			$T_{amb} = -40^\circ\text{C to } +85^\circ\text{C}$ $V_{CC} = +5.0\text{V} \pm 0.5\text{V}$			
			Min	Typ	Max	Min	Max		
$t_{PLH}$ $t_{PHL}$	Propagation delay An to $Y_n$	1	1.0 1.0	2.7 3.9	4.3 5.3	1.0 1.0	4.7 5.6	ns	
$t_{PZH}$ $t_{PZL}$	Output enable time to High and Low level	2	1.1 2.1	3.3 5.4	4.8 7.6	1.1 2.1	5.8 8.4	ns	
$t_{PHZ}$ $t_{PLZ}$	Output disable time from High and Low level	2	1.7 1.7	3.8 3.4	5.6 5.8	1.7 1.7	6.6 6.4	ns	

## AC WAVEFORMS

$V_M = 1.5V$ ,  $V_{IN} = GND$  to  $3.0V$



Waveform 1. Waveforms Showing the Input (An) to Output ( $Y_n$ ) Propagation Delays

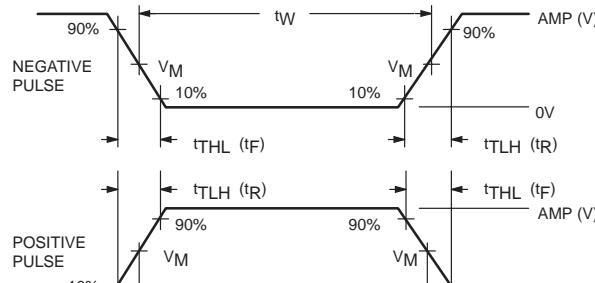
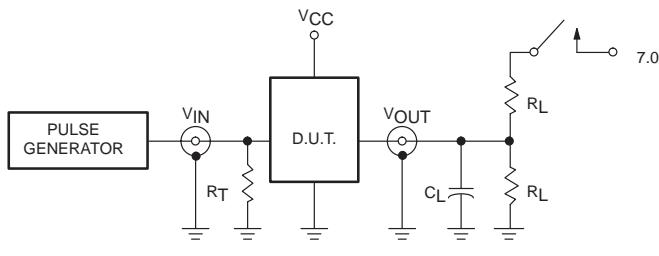


Waveform 2. Waveforms Showing the 3-State Output Enable and Disable Times

# Octal buffer with $30\Omega$ series termination resistors (3-State)

74ABT2241

## TEST CIRCUIT AND WAVEFORMS



### SWITCH POSITION

TEST	SWITCH
$t_{PLZ}$	closed
$t_{PZL}$	closed
All other	open

### DEFINITIONS

$R_L$  = Load resistor; see AC CHARACTERISTICS for value.

$C_L$  = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

$R_T$  = Termination resistance should be equal to  $Z_{OUT}$  of pulse generators.

FAMILY	INPUT PULSE REQUIREMENTS				
	Amplitude	Rep. Rate	$t_W$	$t_R$	$t_F$
74ABT	3.0V	1MHz	500ns	2.5ns	2.5ns

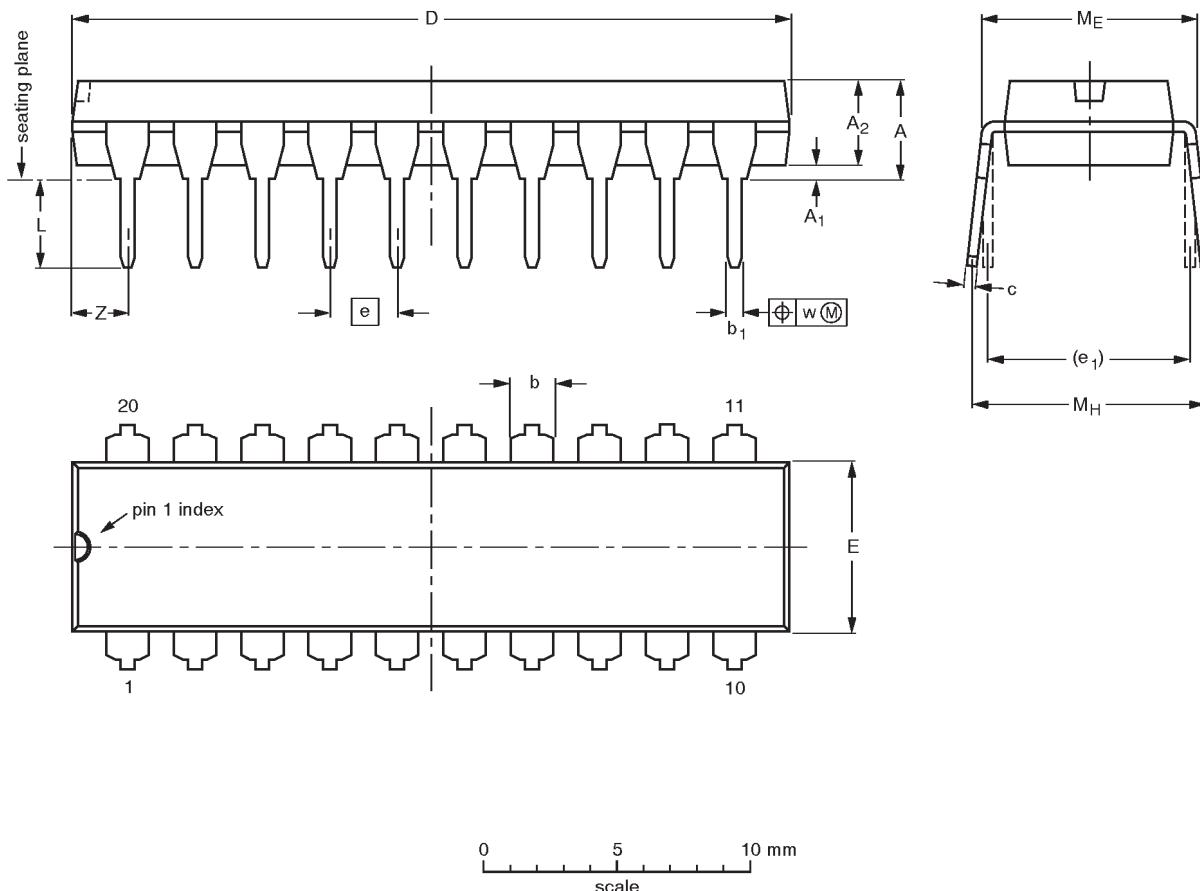
SA00012

Octal buffer with  $30\Omega$  series termination resistors  
(3-State)

74ABT2241

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 <sub>1</sub> min.	A <sub>2</sub> max.	b	b <sub>1</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	e <sub>1</sub>	L	M <sub>E</sub>	M <sub>H</sub>	w	Z <sup>(1)</sup> 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.

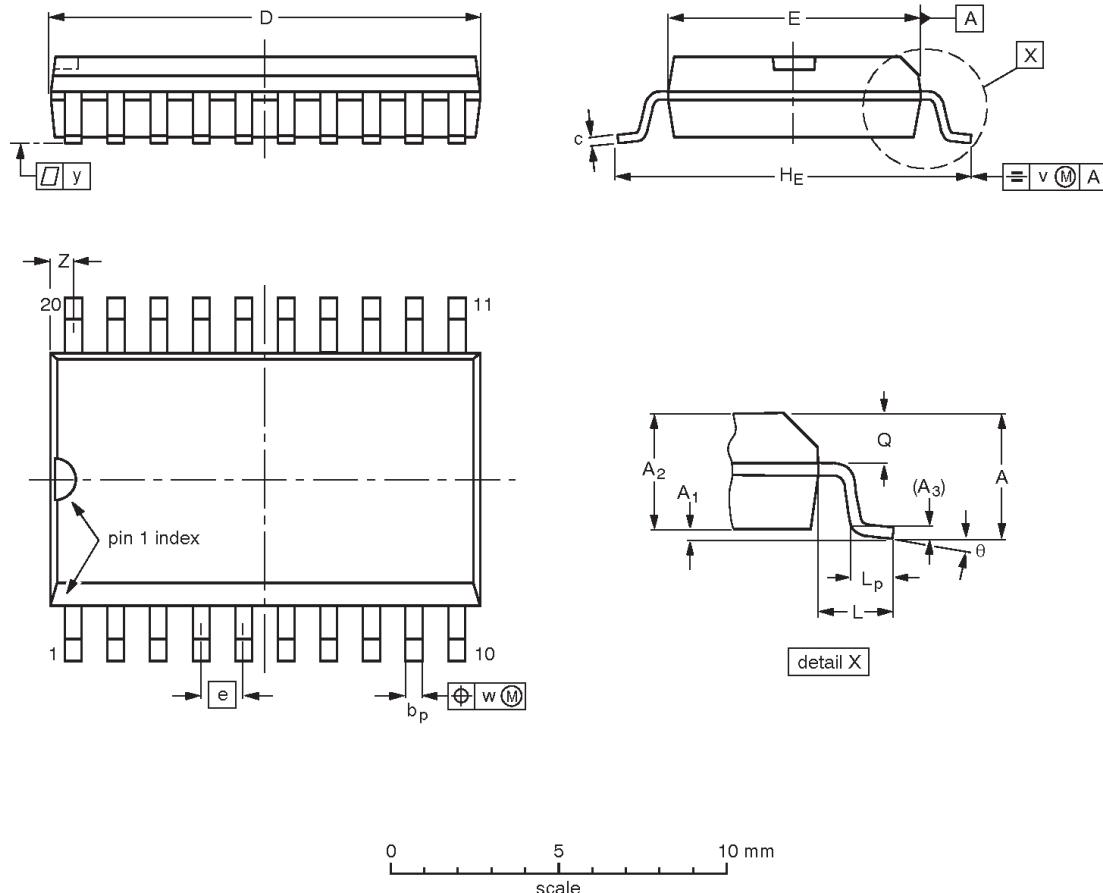
OUTLINE VERSION	REFERENCES			EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ		
SOT146-1			SC603		92-11-17 95-05-24

Octal buffer with  $30\Omega$  series termination resistors  
(3-State)

74ABT2241

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

SOT163-1



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

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2.65 0.10	0.30 0.25	2.45	0.25	0.49 0.36	0.32 0.23	13.0 12.6	7.6 7.4	1.27	10.65 10.00	1.4	1.1 0.4	1.1 1.0	0.25	0.25	0.1	0.9 0.4	8° 0°
inches	0.10 0.004	0.012 0.009	0.096 0.089	0.01	0.019 0.014	0.013 0.009	0.51 0.49	0.30 0.29	0.050	0.42 0.39	0.055	0.043 0.016	0.043 0.039	0.01	0.01	0.004	0.035 0.016	

## Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

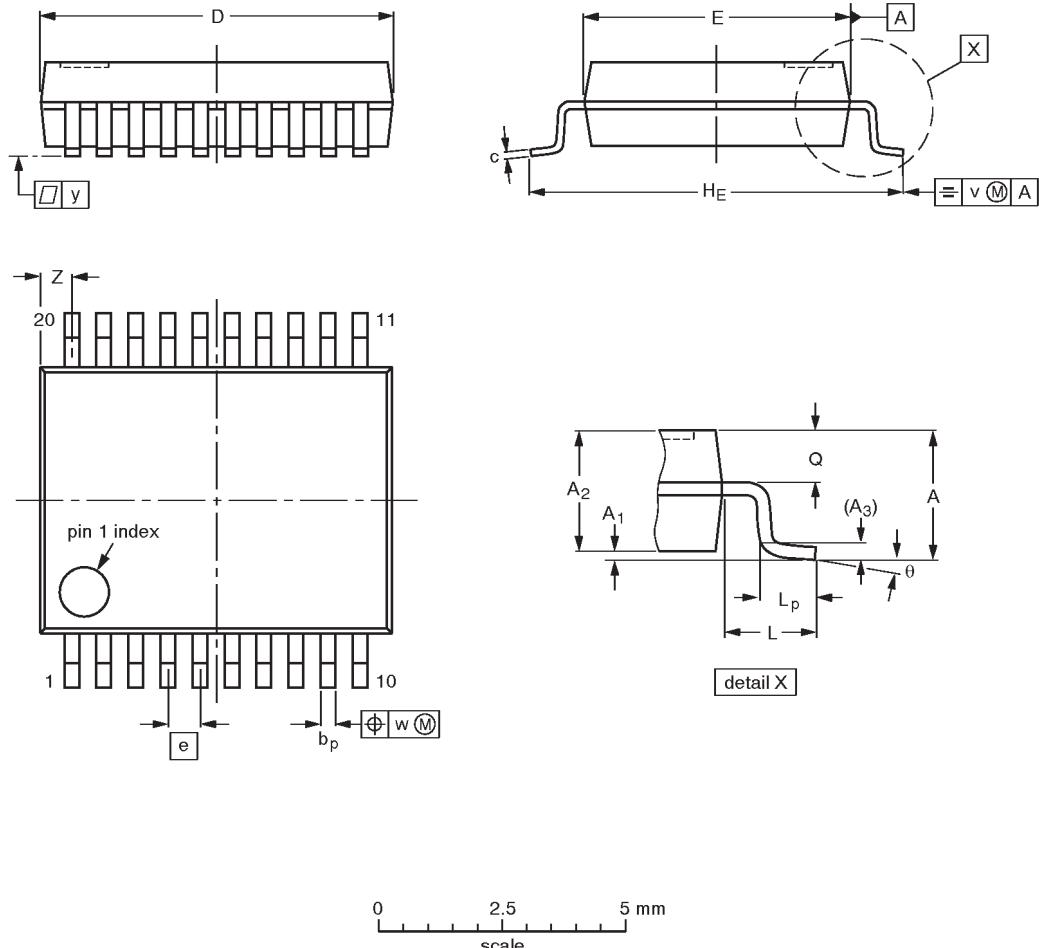
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT163-1	075E04	MS-013AC				92-11-17 95-01-24

Octal buffer with  $30\Omega$  series termination resistors  
(3-State)

74ABT2241

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

SOT339-1



## DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(1)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	2.0 0.05	0.21 1.65	1.80	0.25	0.38 0.25	0.20 0.09	7.4 7.0	5.4 5.2	0.65	7.9 7.6	1.25	1.03 0.63	0.9 0.7	0.2	0.13	0.1	0.9 0.5	8° 0°

## Note

1. Plastic or metal protrusions of 0.20 mm maximum per side are not included.

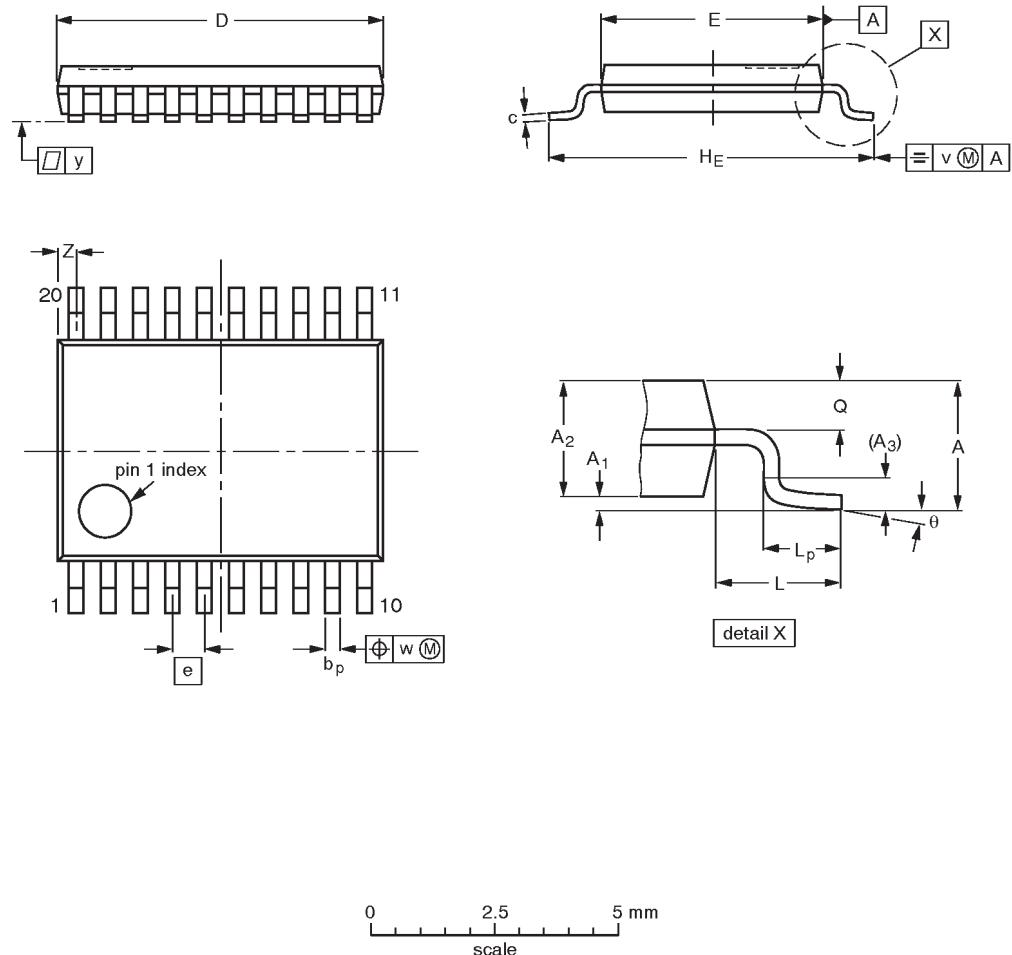
OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT339-1		MO-150AE				93-09-08 95-02-04

Octal buffer with  $30\Omega$  series termination resistors  
(3-State)

74ABT2241

TSSOP20: plastic thin shrink small outline package; 20 leads; body width 4.4 mm

SOT360-1



## DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A <sub>1</sub>	A <sub>2</sub>	A <sub>3</sub>	b <sub>p</sub>	c	D <sup>(1)</sup>	E <sup>(2)</sup>	e	H <sub>E</sub>	L	L <sub>p</sub>	Q	v	w	y	Z <sup>(1)</sup>	θ
mm	1.10 0.05	0.15 0.05	0.95 0.80	0.25	0.30 0.19	0.2 0.1	6.6 6.4	4.5 4.3	0.65	6.6 6.2	1.0	0.75 0.50	0.4 0.3	0.2	0.13	0.1	0.5 0.2	8° 0°

## Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	EIAJ			
SOT360-1		MO-153AC				-93-06-16 95-02-04

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Octal buffer with  $30\Omega$  series termination resistors  
(3-State)

74ABT2241

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**NOTES**

# Octal buffer with $30\Omega$ series termination resistors (3-State)

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## DEFINITIONS

Data Sheet Identification	Product Status	Definition
<i>Objective Specification</i>	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.
<i>Preliminary Specification</i>	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.
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