National Semiconductor

July 1998

54ABT245
Octal Bidirectional Transceiver with TRI-STATE® Outputs

General Description

The 'ABT245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 48 mA on both the A and B ports. The Transmit/Receive ($T/\overline{R}$) input determines the direction of data flow through the bidirectional transceiver. Transmit (active HIGH) enables data from A ports to B ports; Receive (active LOW) enables data from B ports to A ports. The Output Enable input, when HIGH, disables both A and B ports by placing them in a High Z condition.

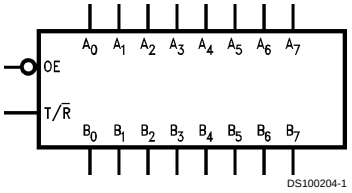
Features

- Bidirectional non-inverting buffers
- A and B output sink capability of 48 mA, source capability of 24 mA
- Guaranteed output skew
- Guaranteed multiple output switching specifications
- Output switching specified for both 50 pF and 250 pF loads
- Guaranteed simultaneous switching, noise level and dynamic threshold performance
- Guaranteed latchup protection
- High impedance glitch-free bus loading during entire power up and power down cycle
- Non-destructive hot insertion capability
- Disable time is less than enable time to avoid bus contention
- Standard Microcircuit Drawing (SMD) 5962-9214801

Ordering Code:

Military	Package Number	Package Description
54ABT245J-QML	J20A	20-Lead Ceramic Dual-In-Line
54ABT245W-QML	W20A	20-Lead Cerpak
54ABT245E-QML	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

Logic Symbol



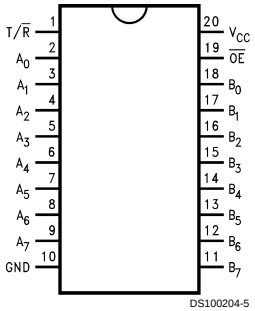
DS100204-1

TRI-STATE® is a registered trademark of National Semiconductor Corporation.

© 1998 National Semiconductor Corporation

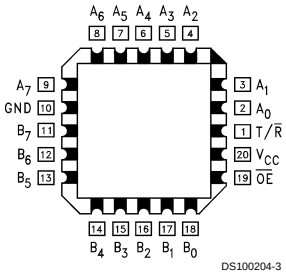
Connection Diagrams

Pin Assignment for DIP and Flatpak.



DS100204-5

Pin Assignment for LCC



DS100204-3

Pin Descriptions

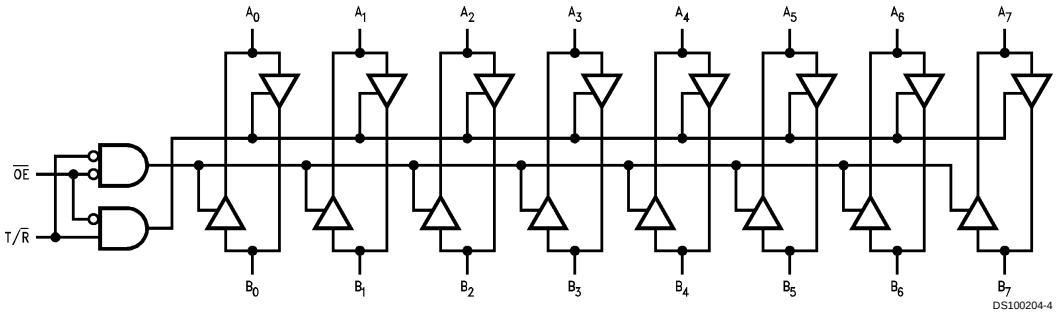
Pin Names	Description
$\overline{OE}$	Output Enable Input (Active LOW)
T/$\overline{R}$	Transmit/Receive Input
A_0–A_7	Side A Inputs or TRI-STATE Outputs
B_0–B_7	Side B Inputs or TRI-STATE Outputs

Truth Table

Inputs		Output
$\overline{OE}$	T/$\overline{R}$	
L	L	Bus B Data to Bus A
L	H	Bus A Data to Bus B
H	X	High Z State

H = HIGH Voltage Level
L = LOW Voltage Level
X = Immaterial

Logic Diagram



DS100204-4

Absolute Maximum Ratings (Note 1)

If Military/Aerospace specified devices are required, please contact the National Semiconductor Sales Office/ Distributors for availability and specifications.

Storage Temperature	−65˚C to +150˚C
Ambient Temperature under Bias	−55˚C to +125˚C
Junction Temperature under Bias	
Ceramic	−55˚C to +175˚C
V_{CC} Pin Potential to	
Ground Pin	−0.5V to +7.0V
Input Voltage (Note 2)	−0.5V to +7.0V
Input Current (Note 2)	−30 mA to +5.0 mA
Voltage Applied to Any Output	
in the Disabled or	
Power-off State	−0.5V to 5.5V
in the HIGH State	−0.5V to V_{CC}
Current Applied to Output	
in LOW State (Max)	twice the rated I_{OL} (mA)
DC Latchup Source Current	−500 mA
Over Voltage Latchup (I/O)	10V

Recommended Operating Conditions

Free Air Ambient Temperature	
Military	−55˚C to +125˚C
Supply Voltage	
Military	+4.5V to +5.5V
Minimum Input Edge Rate	(ΔV/Δt)
Data Input	50 mV/ns
Enable Input	20 mV/ns

Note 1: Absolute maximum ratings are values beyond which the device may be damaged or have its useful life impaired. Functional operation under these conditions is not implied.

Note 2: Either voltage limit or current limit is sufficient to protect inputs.

DC Electrical Characteristics

Symbol	Parameter		ABT245 Min	ABT245 Typ	ABT245 Max	Units	V_{CC}	Conditions
V_{IH}	Input HIGH Voltage		2.0			V		Recognized HIGH Signal
V_{IL}	Input LOW Voltage				0.8	V		Recognized LOW Signal
V_{CD}	Input Clamp Diode Voltage				−1.2	V	Min	I_{IN} = −18 mA ($\overline{OE}$, T/$\overline{R}$)
V_{OH}	Output HIGH Voltage	54ABT	2.5			V	Min	I_{OH} = −3 mA (A_n, B_n)
		54ABT	2.0			V	Min	I_{OH} = −24 mA (A_n, B_n)
V_{OL}	Output LOW Voltage	54ABT			0.55	V	Min	I_{OL} = 48 mA (A_n, B_n)
I_{IH}	Input HIGH Current				5 5	µA	Max	V_{IN} = 2.7V ($\overline{OE}$, T/$\overline{R}$) (Note 3) V_{IN} = V_{CC} ($\overline{OE}$, T/$\overline{R}$)
I_{BVI}	Input HIGH Current Breakdown Test				7	µA	Max	V_{IN} = 7.0V ($\overline{OE}$, T/$\overline{R}$)
I_{BVIT}	Input HIGH Current Breakdown Test (I/O)				100	µA	Max	V_{IN} = 5.5V (A_n, B_n)
I_{IL}	Input LOW Current				−5 −5	µA	Max	V_{IN} = 0.5V ($\overline{OE}$, T/$\overline{R}$) (Note 3) V_{IN} = 0.0V ($\overline{OE}$, T/$\overline{R}$)
V_{ID}	Input Leakage Test		4.75			V	0.0	I_{ID} = 1.9 µA ($\overline{OE}$, T/$\overline{R}$) All Other Pins Grounded
I_{IH} + I_{OZH}	Output Leakage Current				50	µA	0 − 5.5V	V_{OUT} = 2.7V (A_n, B_n); $\overline{OE}$ = 2.0V
I_{IL} + I_{OZL}	Output Leakage Current				−50	µA	0 − 5.5V	V_{OUT} = 0.5V (A_n, B_n); $\overline{OE}$ = 2.0V
I_{OS}	Output Short-Circuit Current		−100		−275	mA	Max	V_{OUT} = 0.0V (A_n, B_n)
I_{CEX}	Output High Leakage Current				50	µA	Max	V_{OUT} = V_{CC} (A_n, B_n)
I_{ZZ}	Bus Drainage Test				100	µA	0.0	V_{OUT} = 5.5V (A_n, B_n); All Others GND
I_{CCH}	Power Supply Current				50	µA	Max	All Outputs HIGH
I_{CCL}	Power Supply Current				30	mA	Max	All Outputs LOW
I_{CCZ}	Power Supply Current				50	µA	Max	$\overline{OE}$ = V_{CC}, T/$\overline{R}$ = GND or V_{CC}; All Other GND or V_{CC}
I_{CCT}	Additional	Outputs Enabled			2.5	mA	Max	V_I = V_{CC} − 2.1V
	I_{CC}/Input	Outputs TRI-STATE			2.5	mA		$\overline{OE}$, T/$\overline{R}$ V_I = V_{CC} − 2.1V
		Outputs TRI-STATE			50	µA		Data Input V_I = V_{CC} − 2.1V
								All Others at V_{CC}or GND.

DC Electrical Characteristics (Continued)

Symbol	Parameter	ABT245			Units	V_{CC}	Conditions
		Min	Typ	Max			
I_{CCD}	Dynamic I_{CC} No Load (Note 3)			0.1	mA/ MHz	 Max	Outputs Open $\overline{OE}$ = GND, T/$\overline{R}$ = GND or V_{CC} One Bit Toggling, 50% Duty Cycle (Note 4)

Note 3: Guaranteed but not tested.

Note 4: For 8 bits toggling, I_{CCD} < 0.8 mA/MHz.

DC Electrical Characteristics

Symbol	Parameter	Min	Max	Units	V_{CC}	Conditions C_L = 50 pF, R_L = 500Ω
V_{OLP}	Quiet Output Maximum Dynamic V_{OL}		1.1	V	5.0	T_A = 25˚C (Note 5)
V_{OLV}	Quiet Output Minimum Dynamic V_{OL}		-0.45	V	5.0	T_A = 25˚C(Note 5)

Note 5: Max number of outputs defined as (n). n − 1 data inputs are driven 0V to 3V. One output at LOW.

AC Electrical Characteristics

Symbol	Parameter	54ABT T_A = −55˚C to +125˚C V_{CC} = 4.5V–5.5V C_L = 50 pF		Units
		Min	Max	
t_{PLH}	Propagation Delay	1.0	4.8	ns
t_{PHL}	Data to Outputs	1.0	4.8	
t_{PZH}	Output Enable	1.0	6.7	ns
t_{PZL}	Time	2.0	7.5	
t_{PHZ}	Output Disable	1.7	7.4	ns
t_{PLZ}	Time	1.7	6.5	

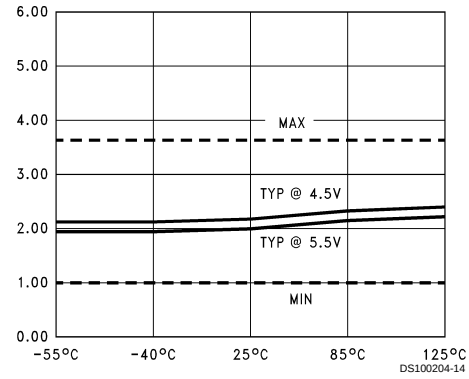
Capacitance

Symbol	Parameter	Typ	Units	Conditions T_A = 25˚C
C_{IN}	Input Capacitance	5.0	pF	V_{CC} = 0V ($\overline{OE}$, T/$\overline{R}$)
$C_{I/O}$ (Note 6)	I/O Capacitance	11.0	pF	V_{CC} = 5.0V (A_n, B_n)

Note 6: $C_{I/O}$ is measured at frequency f = 1 MHz, per MIL-STD-883B, Method 3012.

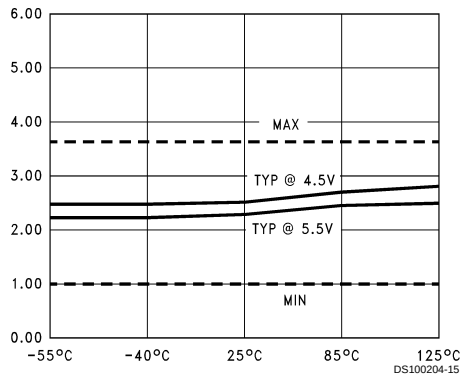
Capacitance (Continued)

t_{PLH} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



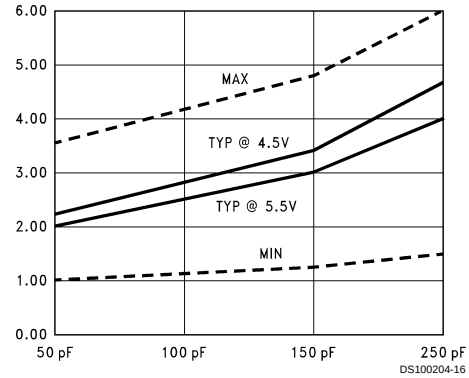
DS100204-14

t_{PHL} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



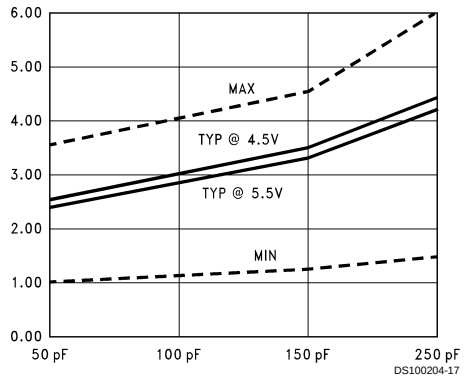
DS100204-15

t_{PLH} vs Load Capacitance
1 Output Switching, T_A = 25˚C



DS100204-16

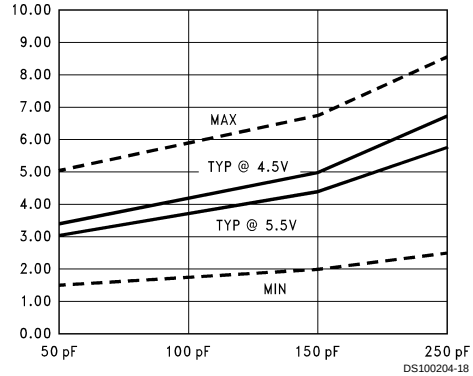
t_{PHL} vs Load Capacitance
1 Output Switching, T_A = 25˚C



DS100204-17

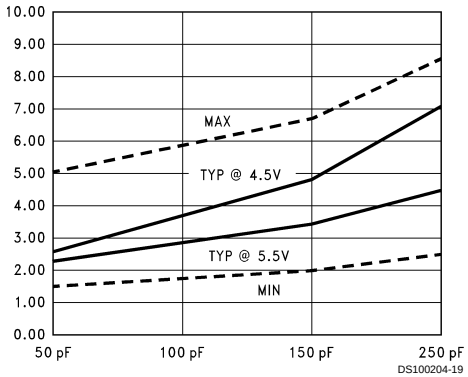
Dashed lines represent design characteristics; for specified guarantees, refer to AC Characteristics Table.

t_{PLH} vs Load Capacitance
8 Outputs Switching, T_A = −40˚C to +85˚C



DS100204-18

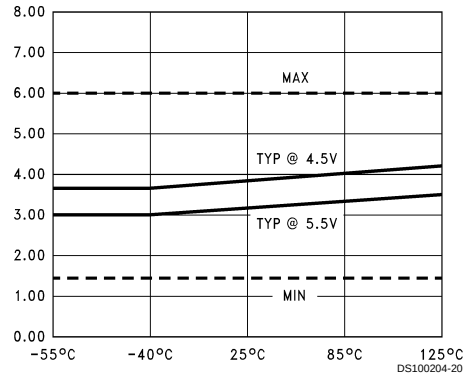
t_{PHL} vs Load Capacitance
8 Outputs Switching, T_A = 25˚C



DS100204-19

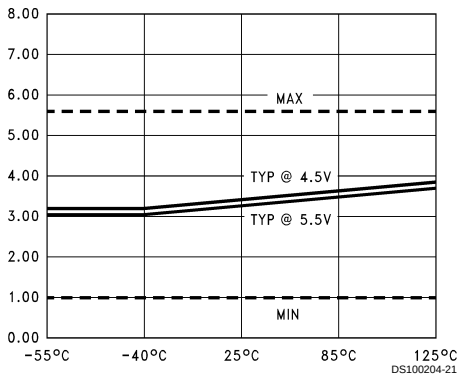
Capacitance (Continued)

t_{PZL} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



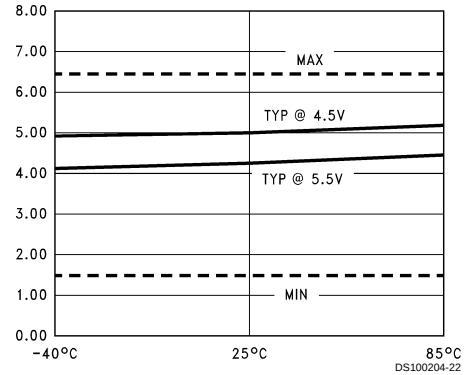
DS100204-20

t_{PLZ} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



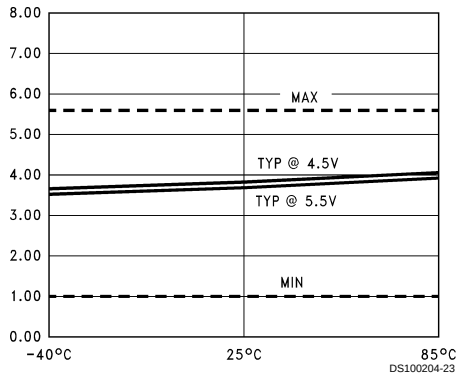
DS100204-21

t_{PZL} vs Temperature (T_A)
C_L = 50 pF, 8 Outputs Switching



DS100204-22

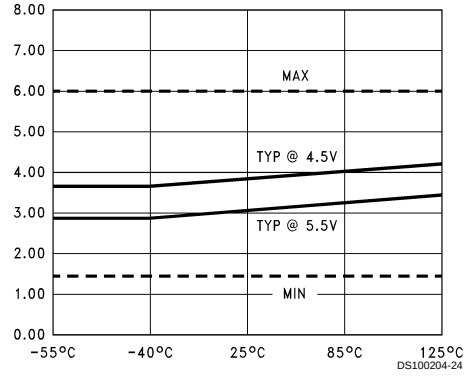
t_{PLZ} vs Temperature (T_A)
C_L = 50 pF, 8 Outputs Switching



DS100204-23

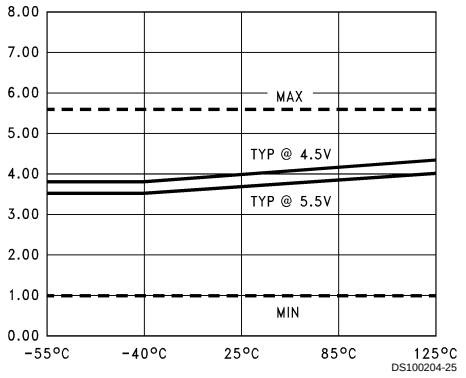
Dashed lines represent design characteristics; for specified guarantees, refer to AC Characteristics Table.

t_{PZH} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



DS100204-24

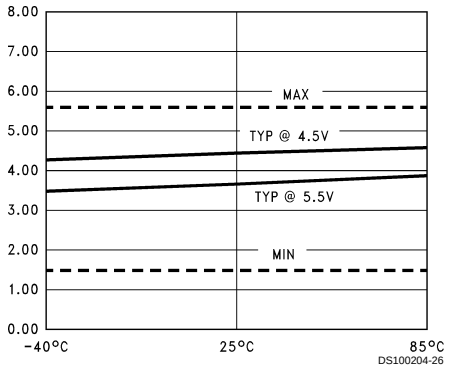
t_{PHZ} vs Temperature (T_A)
C_L = 50 pF, 1 Output Switching



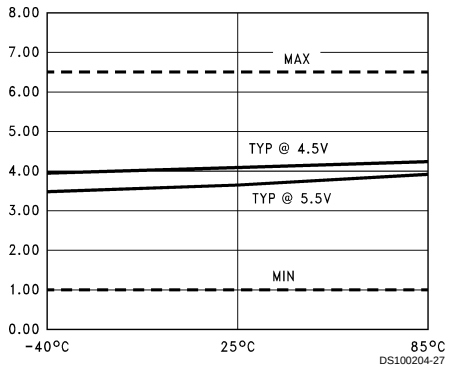
DS100204-25

Capacitance (Continued)

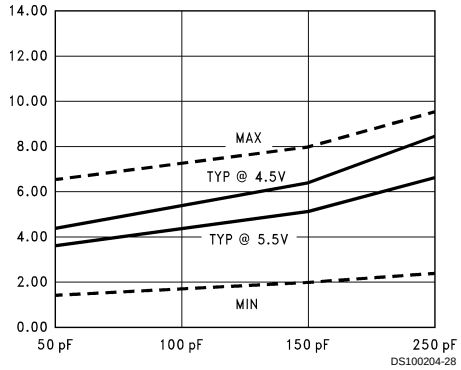
t_{PZH} vs Temperature (T_A)
C_L = 50 pF, 8 Outputs Switching



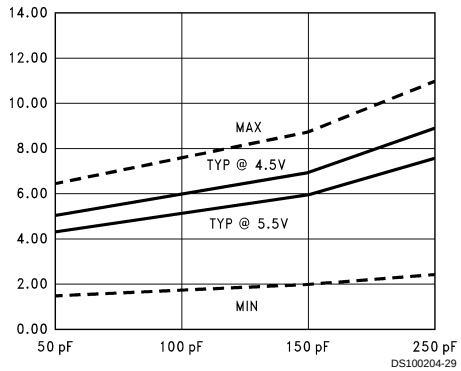
t_{PHZ} vs Temperature (T_A)
C_L = 50 pF, 8 Outputs Switching



t_{PZH} vs Load Capacitance
8 Outputs Switching, T_A = 25˚C

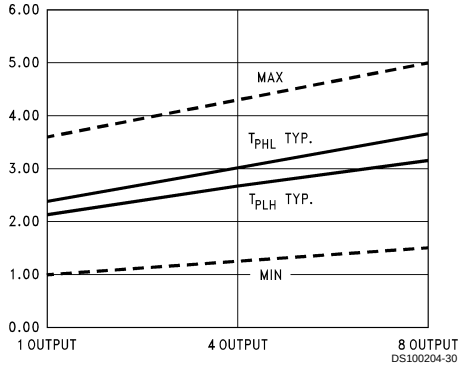


t_{PZL} vs Load Capacitance
8 Outputs Switching, T_A = 25˚C

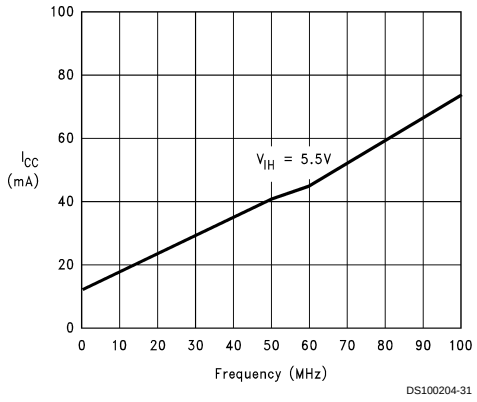


Dashed lines represent design characteristics; for specified guarantees, refer to AC Characteristics Table.

t_{PLH} and t_{PHL} vs Number Outputs Switching
V_{CC} = 5.0V, T_A = 25˚C, C_L = 50 pF

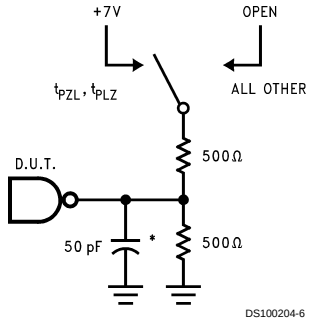


I_{CC} vs Frequency, Average, T_A = 25˚C,
All Outputs Unloaded/Unterminated



Dashed lines represent design characteristics; for specified guarantees, refer to AC Characteristics Table.

AC Loading



*Includes jig and probe capacitance

FIGURE 1. Standard AC Test Load

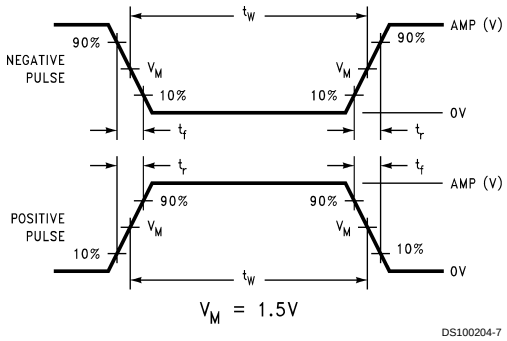


FIGURE 2. Test Input Signal Levels

Amplitude	Rep. Rate	t_w	t_r	t_f
3.0V	1 MHz	500 ns	2.5 ns	2.5 ns

FIGURE 3. Test Input Signal Requirements

AC Waveforms

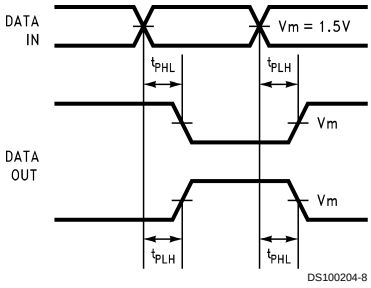


FIGURE 4. Propagation Delay Waveforms for Inverting and Non-Inverting Functions

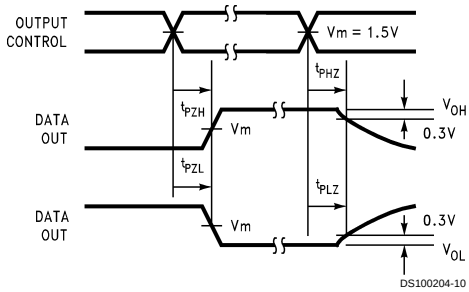
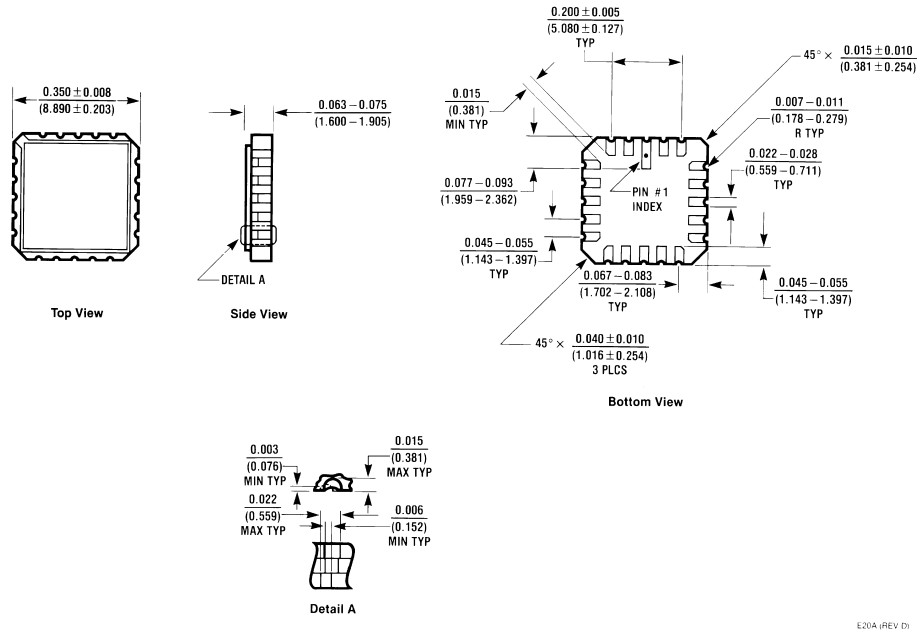
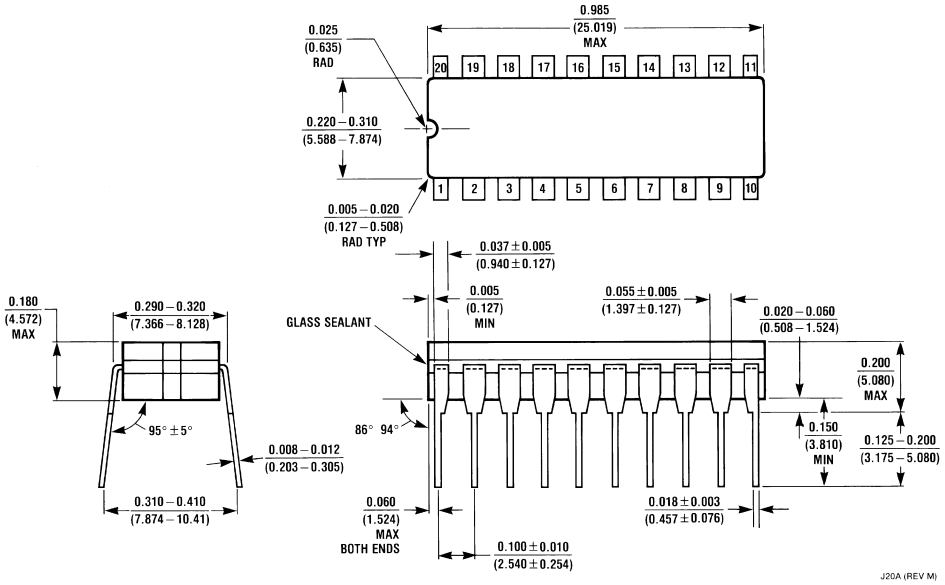


FIGURE 5. TRI-STATE Output HIGH and LOW Enable and Disable Times

Physical Dimensions inches (millimeters) unless otherwise noted

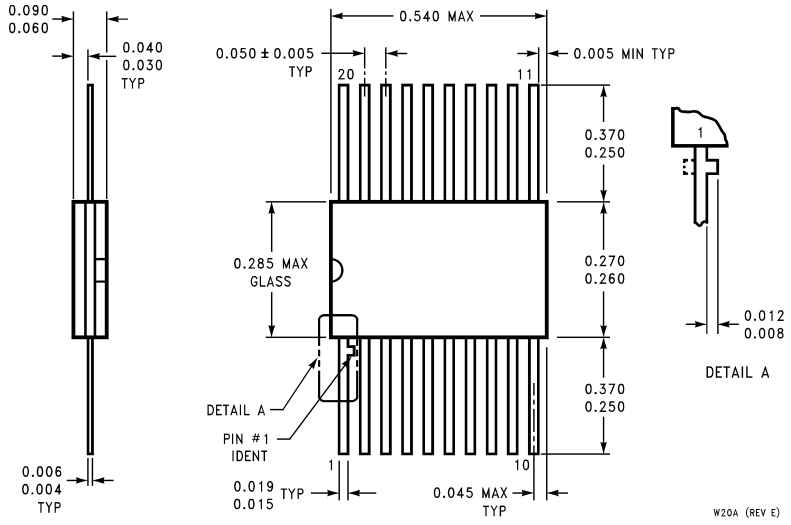


20-Terminal Ceramic Chip Carrier (L)
NS Package Number E20A



20-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J20A

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



20-Lead Ceramic Flatpak (F)
NS Package Number W20A

LIFE SUPPORT POLICY

NATIONAL'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF NATIONAL SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

National Semiconductor Corporation
Americas
Tel: 1-800-272-9959
Fax: 1-800-737-7018
Email: support@nsc.com

www.national.com

National Semiconductor Europe
Fax: +49 (0) 1 80-530 85 86
Email: europe.support@nsc.com
Deutsch Tel: +49 (0) 1 80-530 85 85
English Tel: +49 (0) 1 80-532 78 32
Français Tel: +49 (0) 1 80-532 93 58
Italiano Tel: +49 (0) 1 80-534 16 80

National Semiconductor Asia Pacific Customer Response Group
Tel: 65-2544466
Fax: 65-2504466
Email: sea.support@nsc.com

National Semiconductor Japan Ltd.
Tel: 81-3-5620-6175
Fax: 81-3-5620-6179

National does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and National reserves the right at any time without notice to change said circuitry and specifications.

OCEAN CHIPS
Океан Электроники
Поставка электронных компонентов

Компания «Океан Электроники» предлагает заключение долгосрочных отношений при поставках импортных электронных компонентов на взаимовыгодных условиях!

Наши преимущества:

- Поставка оригинальных импортных электронных компонентов напрямую с производств Америки, Европы и Азии, а так же с крупнейших складов мира;
- Широкая линейка поставок активных и пассивных импортных электронных компонентов (более 30 млн. наименований);
- Поставка сложных, дефицитных, либо снятых с производства позиций;
- Оперативные сроки поставки под заказ (от 5 рабочих дней);
- Экспресс доставка в любую точку России;
- Помощь Конструкторского Отдела и консультации квалифицированных инженеров;
- Техническая поддержка проекта, помощь в подборе аналогов, поставка прототипов;
- Поставка электронных компонентов под контролем ВП;
- Система менеджмента качества сертифицирована по Международному стандарту ISO 9001;
- При необходимости вся продукция военного и аэрокосмического назначения проходит испытания и сертификацию в лаборатории (по согласованию с заказчиком);
- Поставка специализированных компонентов военного и аэрокосмического уровня качества (Xilinx, Altera, Analog Devices, Intersil, Interpoint, Microsemi, Actel, Aeroflex, Peregrine, VPT, Syfer, Eurofarad, Texas Instruments, MS Kennedy, Miteq, Cobham, E2V, MA-COM, Hittite, Mini-Circuits, General Dynamics и др.);

Компания «Океан Электроники» является официальным дистрибьютором и эксклюзивным представителем в России одного из крупнейших производителей разъемов военного и аэрокосмического назначения «**JONHON**», а так же официальным дистрибьютором и эксклюзивным представителем в России производителя высокотехнологичных и надежных решений для передачи СВЧ сигналов «**FORSTAR**».

AVIC JONHON

«JONHON» (основан в 1970 г.)

Разъемы специального, военного и аэрокосмического назначения:

(Применяются в военной, авиационной, аэрокосмической, морской, железнодорожной, горно- и нефтедобывающей отраслях промышленности)

«FORSTAR» (основан в 1998 г.)

ВЧ соединители, коаксиальные кабели, кабельные сборки и микроволновые компоненты:

(Применяются в телекоммуникациях гражданского и специального назначения, в средствах связи, РЛС, а так же военной, авиационной и аэрокосмической отраслях промышленности).

FORSTAR®

Телефон: 8 (812) 309-75-97 (многоканальный)
Факс: 8 (812) 320-03-32
Электронная почта: ocean@oceanchips.ru
Web: http://oceanchips.ru/
Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А