

74FR245

Octal Bidirectional Transceiver with TRI-STATE® Outputs

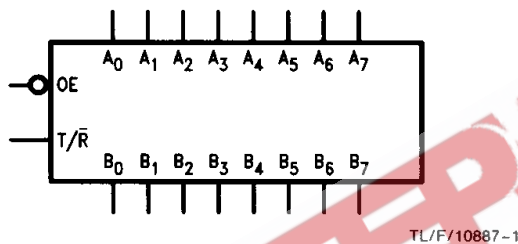
General Description

The 'FR245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 64 mA on both the A and B ports. The Transmit/Receive (T/\bar{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.

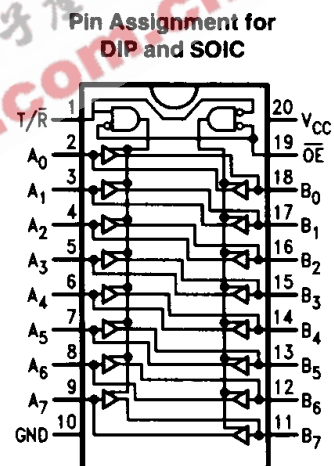
Features

- Non-inverting buffers
- Bidirectional data path
- A and B output sink capability of 64 mA, source capability of 15 mA
- Guaranteed 4000V minimum ESD protection
- Guaranteed pin to pin skew

Logic Symbol



Connection Diagram



Pin Descriptions

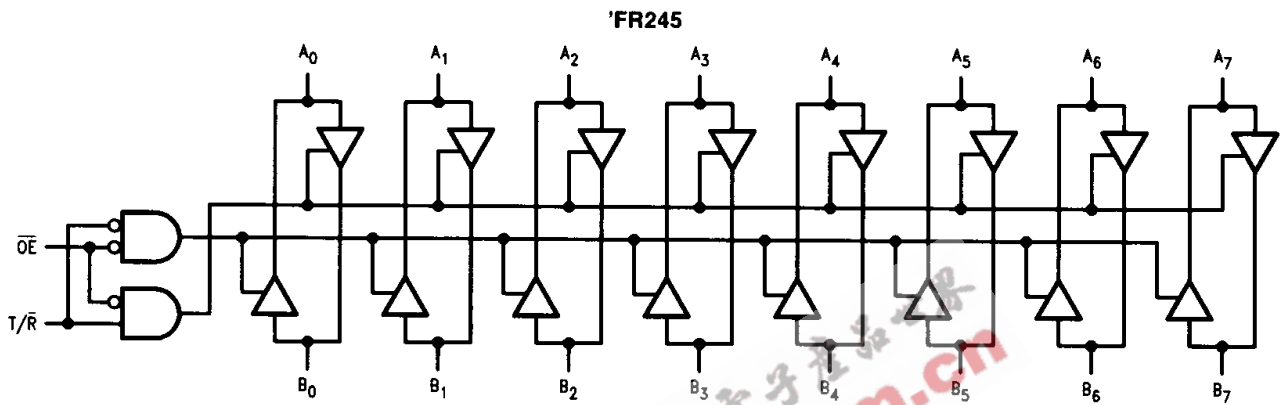
Pin Names	Description
\overline{OE}	Output Enable Input (Active LOW)
T/ \overline{R}	Transmit/Receive Input
A ₀ -A ₇	Side A Inputs or TRI-STATE Outputs
B ₀ -B ₇	Side B Inputs or TRI-STATE Outputs

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



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
Plastic	-55°C to +150°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 Output in HIGH State (with V _{CC} = 0V)	
Standard Output	-0.5V to V _{CC}
TRI-STATE Output	-0.5V to +5.5V

Current Applied to Output in LOW State (Max)

twice the rated I_{OL} (mA)

ESD Last Passing Voltage (Min)

4000V

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.

Recommended Operating Conditions

Free Air Ambient Temperature

Commercial

0°C to +70°C

Supply Voltage

Commercial

+4.5V to +5.5V

DC Electrical Characteristics

Symbol	Parameter	74FR			Units	V _{CC}	Conditions
		Min	Typ	Max			
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
V _{OH}	Output HIGH Voltage			2.4	V	Min	I _{OH} = -3 mA (A _n , B _n)
				2.0	V	Min	I _{OH} = -15 mA (A _n , B _n)
V _{OL}	Output LOW Voltage			0.55	V	Min	I _{OL} = 64 mA (A _n , B _n)
I _{IH}	Input HIGH Current			5	μA	Max	V _{IN} = 2.7V (OE, T/ \bar{R})
I _{BVI}	Input HIGH Current Breakdown Test			7	μA	Max	V _{IN} = 7.0V (OE, T/ \bar{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			-250	μA	Max	V _{IN} = 0.5V (OE, T/ \bar{R})
V _{ID}	Input Leakage Test	4.75			V	0.0	I _{ID} = 1.9 μA All Other Pins Grounded
I _{OD}	Output Circuit Leakage Test			3.75	V	0.0	V _{IOD} = 150 mV All Other Pins Grounded
I _{IH} + I _{OZH}	Output Leakage Current			25	μA	Max	V _{OUT} = 2.7V (A _n , B _n)
I _{IL} + I _{OZL}	Output Leakage Current			-150	μA	Max	V _{OUT} = 0.5V (A _n , B _n)
I _{OS}	Output Short-Circuit Current	-100		-225	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} = 5.25V (A _n , B _n)
I _{CCH}	Power Supply Current		55	75	mA	Max	All Outputs HIGH
I _{CCL}	Power Supply Current		75	110	mA	Max	All Outputs LOW
I _{CCZ}	Power Supply Current		55	75	mA	Max	Outputs TRI-STATE
C _{IN}	Input Capacitance		8.0		pF	5.0	OE, T/ \bar{R}
			17.0		pF	5.0	A _n , B _n

AC Electrical Characteristics

Symbol	Parameter	74FR			74FR		Units
		$T_A = +25^\circ\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A = \text{Comm}$ $V_{CC} = \text{Comm}$ $C_L = 50\text{ pF}$		
		Min	Typ	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay A_n to B_n or B_n to A_n	1.0	2.6	3.9	1.0	3.9	ns
t_{PZH} t_{PZL}	Output Enable Time	2.5	5.0	7.0	2.5	7.0	
t_{PHZ} t_{PLZ}	Output Disable Time	1.7	3.7	6.5	1.7	6.5	ns

Extended AC Characteristics

Symbol	Parameter	74FR		74FR		Units
		$T_A = +25^\circ\text{C}$ $V_{CC} = \text{Comm}$ $C_L = 50\text{ pF}$ Eight Outputs Switching (Note 2)		$T_A = \text{Comm}$ $V_{CC} = \text{Comm}$ $C_L = 250\text{ pF}$ (Note 3)		
		Min	Max	Min	Max	
t_{PLH} t_{PHL}	Propagation Delay A_n to B_n or B_n to A_n	1.0	5.9	2.5	7.5	ns
t_{PZH} t_{PZL}	Output Enable Time	2.5	11.9			
t_{PHZ} t_{PLZ}	Output Disable Time	1.3	6.5			ns
t_{OSHL} (Note 1)	Pin to Pin Skew for HL Transitions		TBD			ns
t_{OSLH} (Note 1)	Pin to Pin Skew for LH Transitions		TBD			ns
t_{OST} (Note 1)	Pin to Pin Skew for HL/LH Transitions		TBD			ns

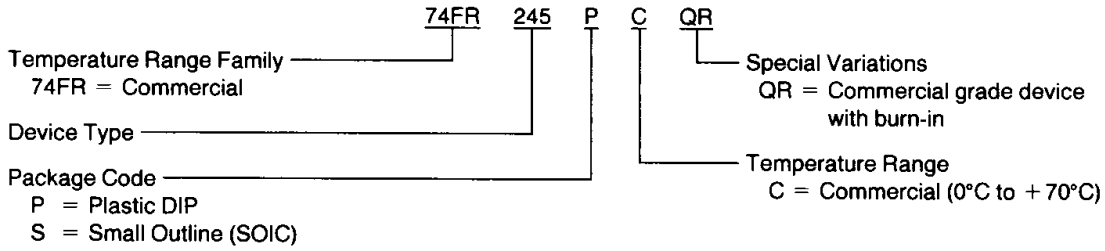
Note 1: Skew is defined as the absolute value of the difference between the actual propagation delays for any two outputs of the same device. The specification applies to any outputs switching high to low (t_{OSHL}), low to high (t_{OSLH}), or any combination of high to low and/or low to high (t_{OST}).

Note 2: This specification is guaranteed but not tested. The limits apply to propagation delays for all paths described switching in phase, i.e., all low-to-high, high-to-low, TRI-STATE-to-high, etc.

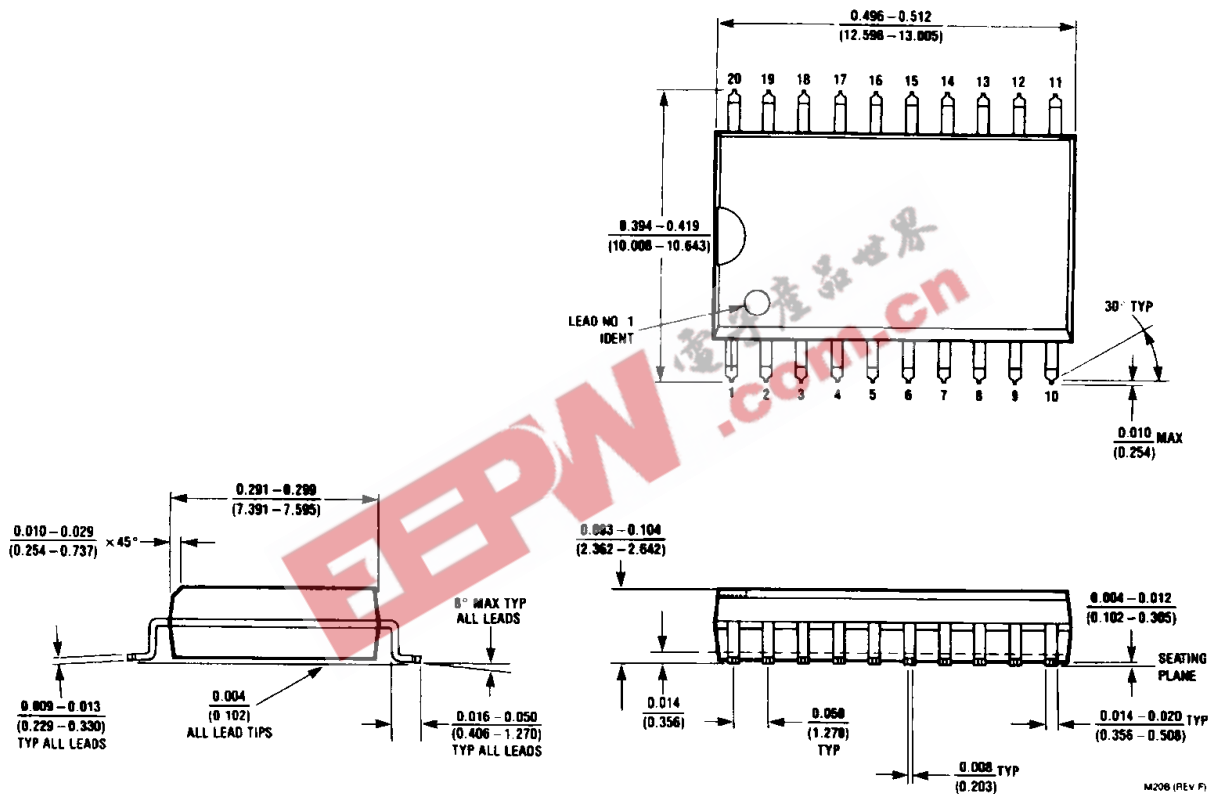
Note 3: These specifications guaranteed but not tested. The limits represent propagation delays with 250 pF load capacitors in place of the 50 pF load capacitors in the standard AC load. This specification pertains to single output switching only.

Ordering Information

The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



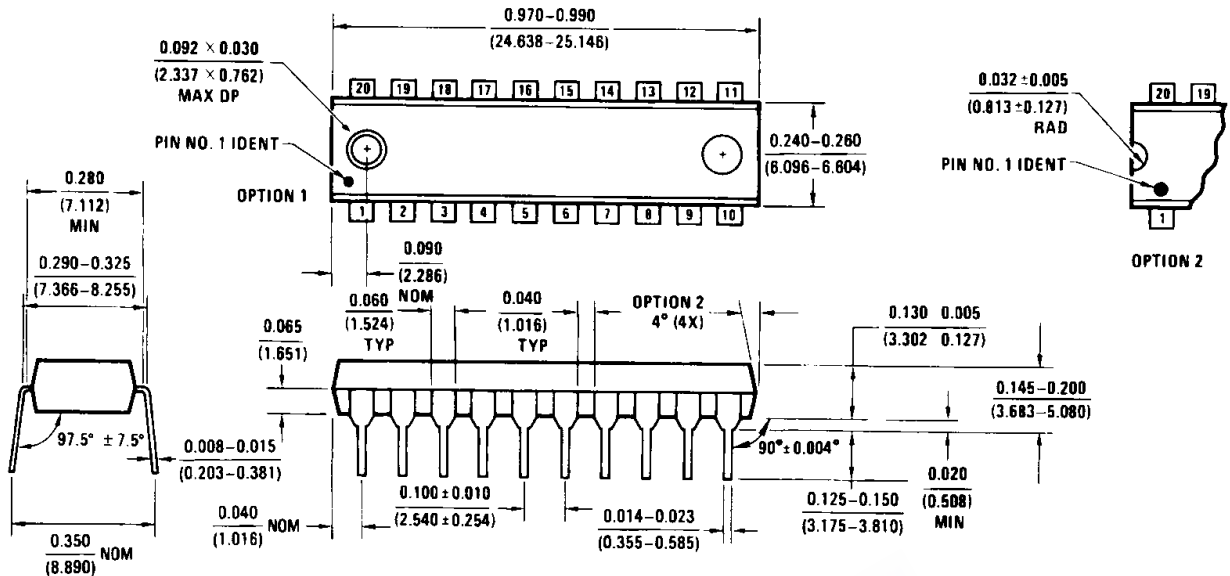
Physical Dimensions inches (millimeters)



20-Lead Small Outline Integrated Circuit (S)
NS Package Number M20B

Physical Dimensions inches (millimeters) (Continued)

Lit # 114630



20-Lead Plastic Dual-In-Line Package (P)
NS Package Number N20B

N20B (REV A)

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