

# 54F/74F245 Octal Bidirectional Transceiver with TRI-STATE® Outputs

## General Description

The 'F245 contains eight non-inverting bidirectional buffers with TRI-STATE outputs and is intended for bus-oriented applications. Current sinking capability is 24 mA (20 mA Mil) at the A ports and 64 mA (48 mA Mil) at the B ports. The Transmit/Receive (T/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

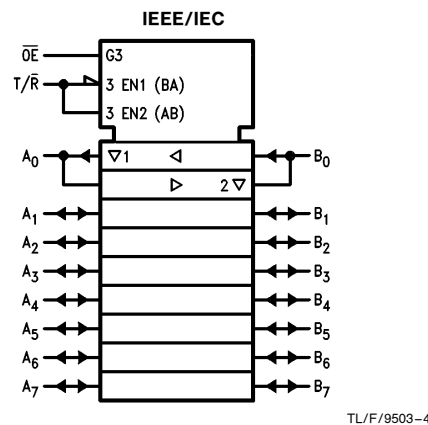
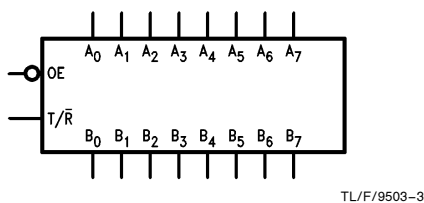
- Non-inverting buffers
- Bidirectional data path
- A outputs sink 24 mA (20 mA Mil)
- B outputs sink 64 mA (48 mA Mil)
- Guaranteed 4000V minimum ESD protection

Commercial	Military	Package Number	Package Description
74F245PC		N20A	20-Lead (0.300" Wide) Molded Dual-In-Line
	54F245DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
74F245SC (Note 1)		M20B	20-Lead (0.300" Wide) Molded Small Outline, JEDEC
74F245SJ (Note 1)		M20D	20-Lead (0.300" Wide) Molded Small Outline, EIAJ
74F245MSA (Note 1)		MSA20	20-Lead Molded Shrink Small Outline, EIAJ Type II
	54F245FM (Note 2)	W20A	20-Lead Cerpack
	54F245LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

**Note 1:** Devices also available in 13" reel. Use suffix = SCX, SJX and MSAX.

**Note 2:** Military grade device with environmental and burn-in processing. Use suffix = DMQB, FMQB and LMQB.

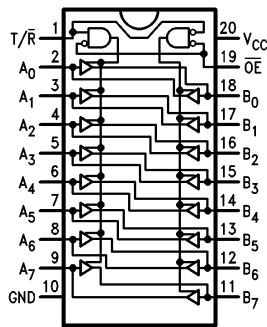
## Logic Symbols



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

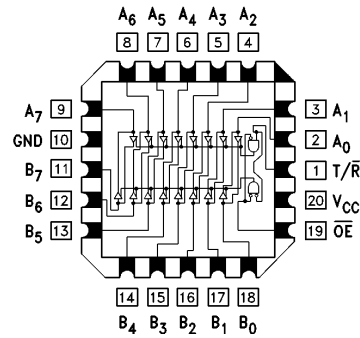
## Connection Diagrams

Pin Assignment for  
DIP, SOIC, SSOP and Flatpak



TL/F/9503-1

Pin Assignment  
for LCC



TL/F/9503-2

## Unit Loading/Fan Out

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
$\overline{OE}$	Output Enable Input (Active LOW)	1.0/2.0	20 $\mu$ A/ -1.2 mA
T/ $\overline{R}$	Transmit/Receive Input	1.0/2.0	20 $\mu$ A/ -1.2 mA
A <sub>0</sub> -A <sub>7</sub>	Side A Inputs or TRI-STATE Outputs	3.5/1.083	70 $\mu$ A/ -0.65 mA
B <sub>0</sub> -B <sub>7</sub>	Side B Inputs or TRI-STATE Outputs	150/40(38.3) 3.5/1.083 600/106.6(80)	-3 mA/24 mA (20 mA) 70 $\mu$ A/ -0.65 mA -12 mA/64 mA (48 mA)

## 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

## 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	-55°C to +175°C
Plastic	-55°C to +150°C
V <sub>CC</sub> 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 <sub>CC</sub> = 0V)	
Standard Output	-0.5V to V <sub>CC</sub>
TRI-STATE Output	-0.5V to +5.5V

Current Applied to Output in LOW State (Max)

twice the rated I<sub>OL</sub> (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

Military -55°C to +125°C

Commercial 0°C to +70°C

Supply Voltage

Military +4.5V to +5.5V

Commercial +4.5V to +5.5V

## DC Electrical Characteristics

Symbol	Parameter		54F/74F			Units	V <sub>CC</sub>	Conditions
			Min	Typ	Max			
V <sub>IH</sub>	Input HIGH Voltage		2.0			V		Recognized as a HIGH Signal
V <sub>IL</sub>	Input LOW Voltage					V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage					V	Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	54F 10% V <sub>CC</sub>	2.4			V	Min	I <sub>OH</sub> = -3 mA (A <sub>n</sub> )
		54F 10% V <sub>CC</sub>	2.0					I <sub>OH</sub> = -12 mA (B <sub>n</sub> )
		74F 10% V <sub>CC</sub>	2.4					I <sub>OH</sub> = -3 mA (A <sub>n</sub> )
		74F 10% V <sub>CC</sub>	2.0					I <sub>OH</sub> = -15 mA (B <sub>n</sub> )
		74F 5% V <sub>CC</sub>	2.7					I <sub>OH</sub> = -3 mA (A <sub>n</sub> )
V <sub>OL</sub>	Output LOW Voltage	54F 10% V <sub>CC</sub>			0.5	V	Min	I <sub>OL</sub> = 20 mA (A <sub>n</sub> )
		54F 10% V <sub>CC</sub>			0.55			I <sub>OL</sub> = 48 mA (B <sub>n</sub> )
		74F 10% V <sub>CC</sub>			0.5			I <sub>OL</sub> = 24 mA (A <sub>n</sub> )
		74F 10% V <sub>CC</sub>			0.55			I <sub>OL</sub> = 64 mA (B <sub>n</sub> )
I <sub>IH</sub>	Input HIGH Current	54F			20.0	μA	Max	V <sub>IN</sub> = 2.7V
		74F			5.0			
I <sub>BVI</sub>	Input HIGH Current Breakdown Test	54F			100	μA	Max	V <sub>IN</sub> = 7.0V ( $\overline{OE}$ , T/ $\overline{R}$ )
		74F			7.0			
I <sub>BVIT</sub>	Input HIGH Current Breakdown (I/O)	54F			1.0	mA	Max	V <sub>IN</sub> = 5.5 V (A <sub>n</sub> , B <sub>n</sub> )
		74F			0.5			
I <sub>CEX</sub>	Output HIGH Leakage Current	54F			250	μA	Max	V <sub>OUT</sub> = V <sub>CC</sub> (A <sub>n</sub> , B <sub>n</sub> )
		74F			50			
V <sub>ID</sub>	Input Leakage Test	74F	4.75			V	0.0	I <sub>ID</sub> = 1.9 μA All Other Pins Grounded
I <sub>OD</sub>	Output Leakage Circuit Current	74F			3.75	μA	0.0	V <sub>IOD</sub> = 150 mV All Other Pins Grounded
I <sub>IL</sub>	Input LOW Current					-1.2	mA	Max V <sub>IN</sub> = 0.5V (T/ $\overline{R}$ , $\overline{OE}$ )
I <sub>IH</sub> + I <sub>OZH</sub>	Output Leakage Current					70	μA	Max V <sub>OUT</sub> = 2.7V (A <sub>n</sub> , B <sub>n</sub> )
I <sub>IL</sub> + I <sub>OZL</sub>	Output Leakage Current					-650	μA	Max V <sub>OUT</sub> = 0.5V (A <sub>n</sub> , B <sub>n</sub> )

## DC Electrical Characteristics (Continued)

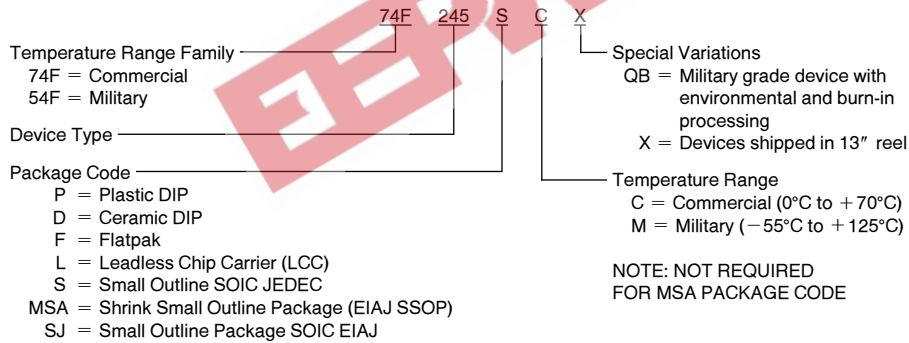
Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions
		Min	Typ	Max			
I <sub>OS</sub>	Output Short-Circuit Current	-60 -100		-150 -225	mA	Max	V <sub>OUT</sub> = 0V (A <sub>n</sub> ) V <sub>OUT</sub> = 0V (B <sub>n</sub> )
I <sub>ZZ</sub>	Bus Drainage Test			500	μA	0.0V	V <sub>OUT</sub> = 5.25V(A <sub>n</sub> , B <sub>n</sub> )
I <sub>CCH</sub>	Power Supply Current		70	90	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current		95	120	mA	Max	V <sub>O</sub> = LOW
I <sub>CCZ</sub>	Power Supply Current		85	110	mA	Max	V <sub>O</sub> = HIGH Z

## AC Electrical Characteristics

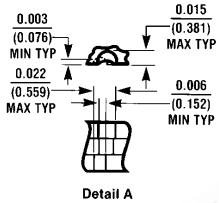
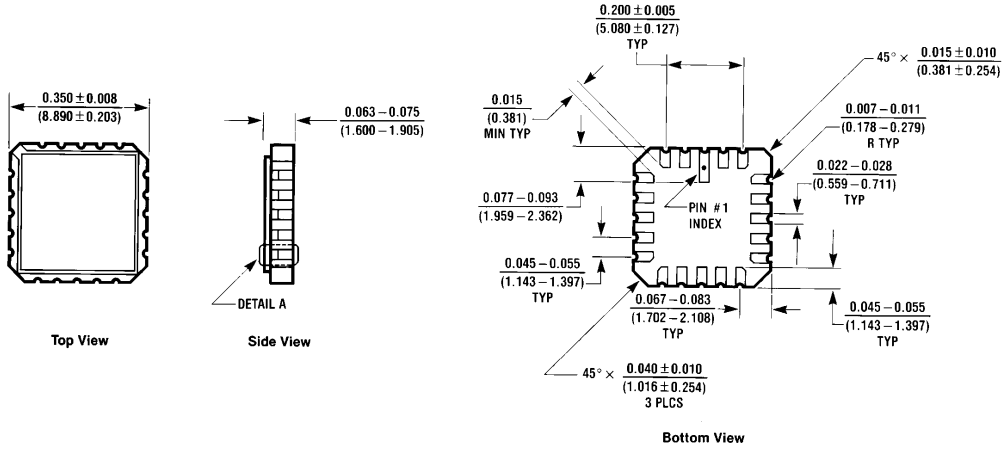
Symbol	Parameter	74F			54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay	2.5	4.2	6.0	2.0	7.5	2.0	7.0	ns
t <sub>PHL</sub>	A <sub>n</sub> to B <sub>n</sub> or B <sub>n</sub> to A <sub>n</sub>	2.5	4.2	6.0	2.0	7.5	2.0	7.0	
t <sub>PZH</sub>	Output Enable Time	3.0	5.3	7.0	2.5	9.0	2.5	8.0	ns
t <sub>PZL</sub>	Output Disable Time	3.5	6.0	8.0	3.0	10.0	3.0	9.0	
t <sub>PHZ</sub>	Output Disable Time	2.0	5.0	6.5	2.0	9.0	2.0	7.5	ns
t <sub>PLZ</sub>	Output Disable Time	2.0	5.0	6.5	2.0	10.0	2.0	7.5	

## 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:

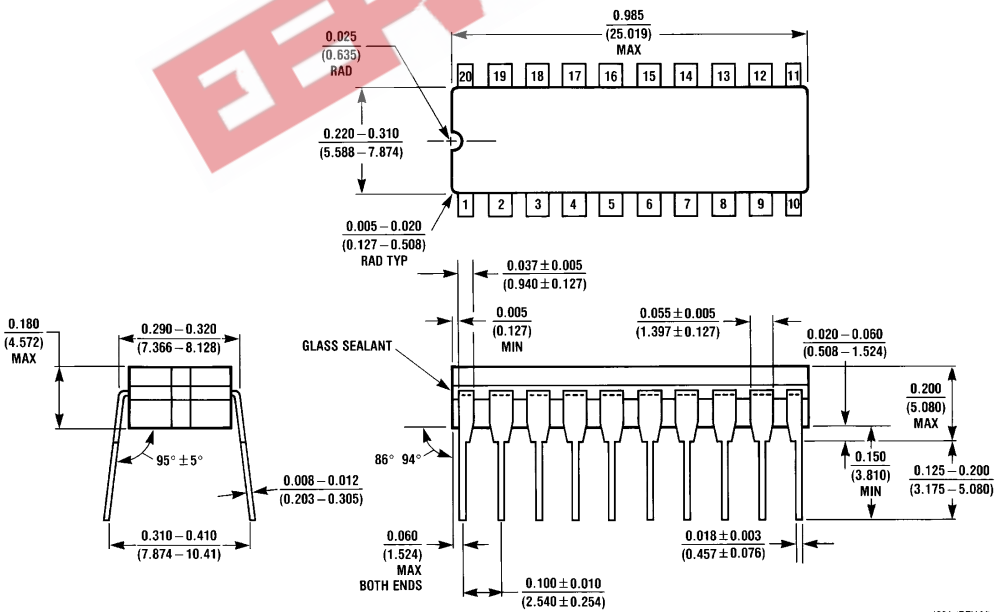


**Physical Dimensions** inches (millimeters)



**20-Lead Ceramic Leadless Chip Carrier (L)**  
NS Package Number E20A

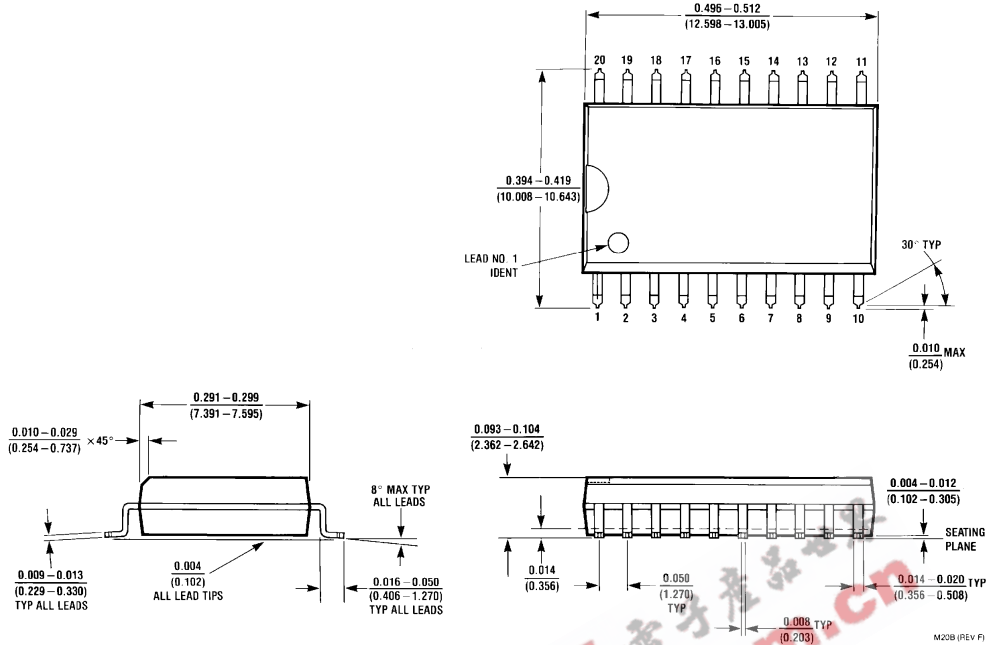
E20A (REV D)



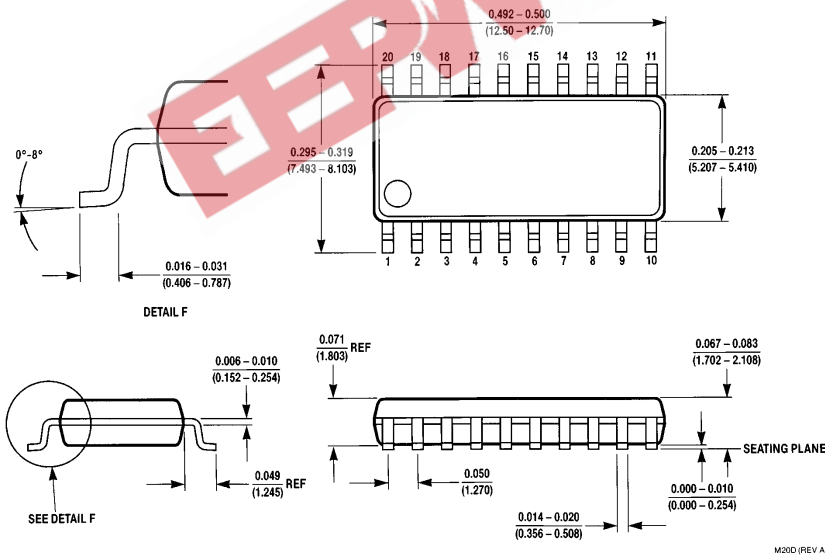
**20-Lead Ceramic Dual-In-Line Package (D)**  
NS Package Number J20A

J20A (REV M)

**Physical Dimensions** inches (millimeters) (Continued)



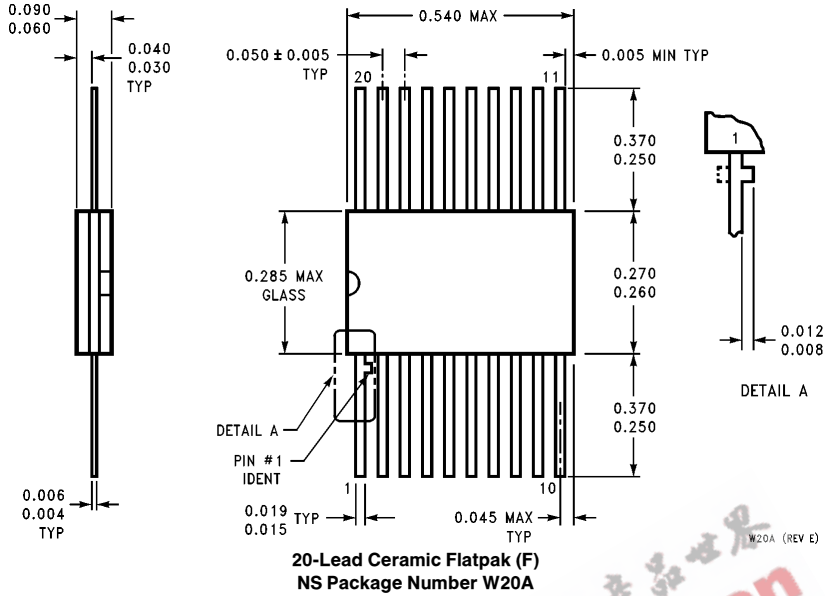
**20-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M20B**



**20-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)  
NS Package Number M20D**



**Physical Dimensions** inches (millimeters) (Continued)



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