

## 54F/74F563 Octal D-Type Latch with TRI-STATE® Outputs

### General Description

The 'F563 is a high-speed octal latch with buffered common Latch Enable (LE) and buffered common Output Enable ( $\overline{OE}$ ) inputs.

This device is functionally identical to the 'F573, but has inverted outputs.

### Features

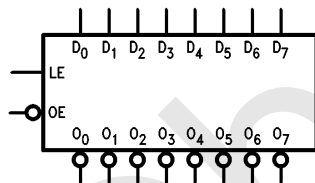
- Inputs and outputs on opposite sides of package allowing easy interface with microprocessors
- Useful as input or output port for microprocessors
- Functionally identical to 'F573

Commercial	Military	Package Number	Package Description
74F563PC		N20A	20-Lead (0.300" Wide) Molded Dual-In-Line
	54F563DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
74F563SC (Note 1)		M20B	20-Lead (0.300" Wide) Molded Small Outline, JEDEC
74F563SJ (Note 1)		M20D	20-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F563FM (Note 2)	W20A	20-Lead Cerpack
	54F563LM (Note 2)	E20A	20-Lead Ceramic Leadless Chip Carrier, Type C

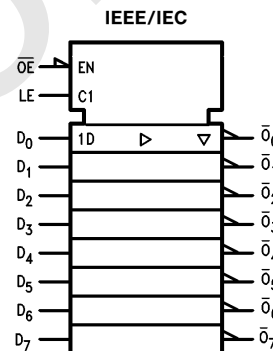
**Note 1:** Devices also available in 13" reel. Use suffix = SCX and SJX.

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

### Logic Symbols



TL/F/9562-3



TL/F/9562-5

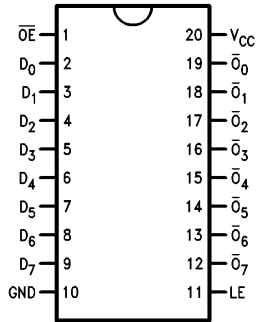
### Unit Loading/Fan Out

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
$D_0$ - $D_7$	Data Inputs	1.0/1.0	20 $\mu$ A/ -0.6 mA
LE	Latch Enable Input (Active HIGH)	1.0/1.0	20 $\mu$ A/ -0.6 mA
$\overline{OE}$	TRI-STATE Output Enable Input (Active LOW)	1.0/1.0	20 $\mu$ A/ -0.6 mA
$\overline{O}_0$ - $\overline{O}_7$	TRI-STATE Latch Outputs	150/40 (33.3)	-3 mA/24 mA (20 mA)

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

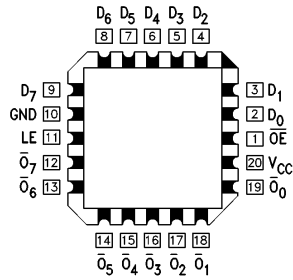
## Connection Diagrams

Pin Assignment for  
DIP, SOIC and Flatpak



TL/F/9562-1

Pin Assignment  
for LCC



TL/F/9562-2

## Functional Description

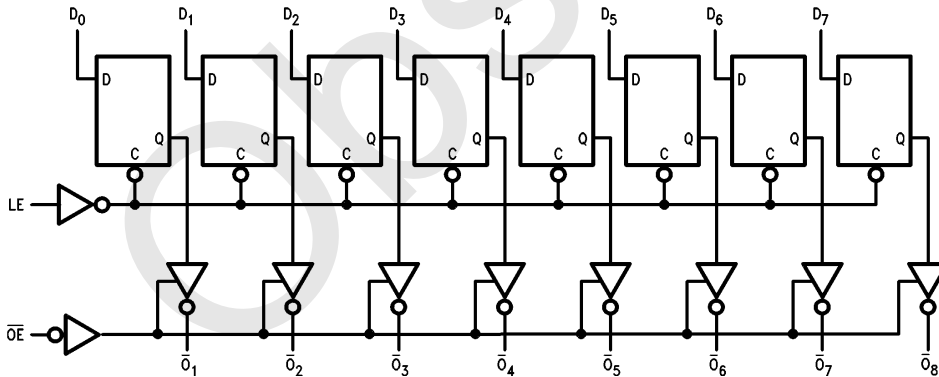
The 'F563 contains eight D-type latches with TRI-STATE output buffers. When the Latch Enable (LE) input is HIGH, data on the  $D_n$  inputs enters the latches. In this condition the latches are transparent, i.e., a latch output will change state each time its D input changes. When LE is LOW the latches store the information that was present on the D inputs a setup time preceding the HIGH-to-LOW transition of LE. The TRI-STATE buffers are controlled by the Output Enable ( $\overline{OE}$ ) input. When  $\overline{OE}$  is LOW, the buffers are in the bi-state mode. When  $\overline{OE}$  is HIGH the buffers are in the high impedance mode but this does not interfere with entering new data into the latches.

Function Table

Inputs			Internal	Output	Function
$\overline{OE}$	LE	D	Q	O	
H	X	X	X	Z	High Z
H	H	L	H	Z	High Z
H	H	H	L	Z	High Z
H	L	X	NC	Z	Latched
L	H	L	H	H	Transparent
L	H	H	L	L	Transparent
L	L	X	NC	NC	Latched

H = HIGH Voltage Level  
L = LOW Voltage Level  
X = Immaterial  
Z = High Impedance  
NC = No Change

## Logic Diagram



TL/F/9562-4

Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

## 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)

**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	0.8			V		Recognized as a LOW Signal
V <sub>CD</sub>	Input Clamp Diode Voltage	-1.2			V	Min	I <sub>IN</sub> = -18 mA
V <sub>OH</sub>	Output HIGH Voltage	54F 10% V <sub>CC</sub>	2.5		V	Min	I <sub>OH</sub> = -1 mA
		54F 10% V <sub>CC</sub>	2.4				I <sub>OH</sub> = -3 mA
		74F 10% V <sub>CC</sub>	2.5				I <sub>OH</sub> = -1 mA
		74F 10% V <sub>CC</sub>	2.4				I <sub>OH</sub> = -3 mA
		74F 5% V <sub>CC</sub>	2.7				I <sub>OH</sub> = -1 mA
		74F 5% V <sub>CC</sub>	2.7				I <sub>OH</sub> = -3 mA
V <sub>OL</sub>	Output LOW Voltage	54F 10% V <sub>CC</sub>	0.5		V	Min	I <sub>OL</sub> = 20 mA
		74F 10% V <sub>CC</sub>	0.5				I <sub>OL</sub> = 24 mA
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
		74F	7.0				
I <sub>CEX</sub>	Output HIGH Leakage Current	54F	250		μA	Max	V <sub>OUT</sub> = V <sub>CC</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				mA	Max	V <sub>IN</sub> = 0.5V
I <sub>OZH</sub>	Output Leakage Current				μA	Max	V <sub>OUT</sub> = 2.7V
I <sub>OZL</sub>	Output Leakage Current				μA	Max	V <sub>OUT</sub> = 0.5V
I <sub>OS</sub>	Output Short-Circuit Current	-60	-150		mA	Max	V <sub>OUT</sub> = 0V
I <sub>ZZ</sub>	Bus Drainage Test				μA	0.0V	V <sub>OUT</sub> = 5.25V
I <sub>CC1</sub>	Power Supply Current	40		61	mA	Max	V <sub>O</sub> = LOW
I <sub>CCZ</sub>	Power Supply Current	40		61	mA	Max	V <sub>O</sub> = HIGH Z

## AC Electrical Characteristics

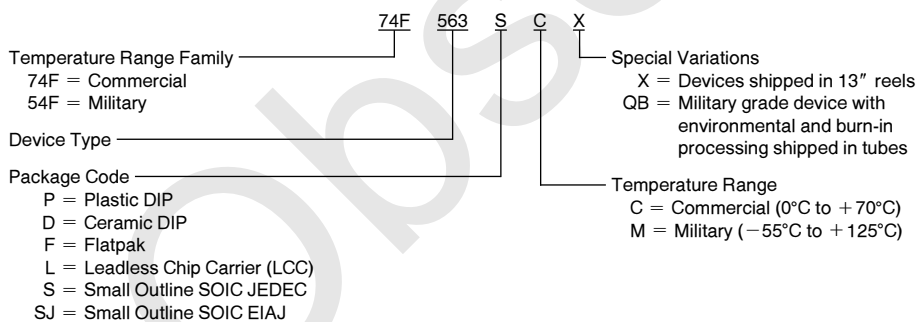
Symbol	Parameter	74F			54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay D <sub>n</sub> to $\overline{O}_n$	3.5		8.5	3.0	10.5	3.0	9.5	ns
		2.5		6.5	2.0	7.5	2.0	7.0	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay LE to $\overline{O}_n$	4.5		9.5	4.0	11.0	4.0	10.5	ns
		3.0		7.0	2.5	7.5	2.5	7.0	
t <sub>PZH</sub> t <sub>PZL</sub>	Output Enable Time	2.0		7.5	2.0	9.5	2.0	9.0	ns
		3.0		8.5	2.5	10.0	1.5	9.5	
t <sub>PHZ</sub> t <sub>PLZ</sub>	Output Disable Time	1.5		5.5	1.5	7.0	1.5	6.5	ns
		1.5		5.5	1.5	5.5	1.5	5.5	

## AC Operating Requirements

Symbol	Parameter	74F		54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V		T <sub>A</sub> , V <sub>CC</sub> = Mil		T <sub>A</sub> , V <sub>CC</sub> = Com		
		Min	Max	Min	Max	Min	Max	
t <sub>s</sub> (H) t <sub>s</sub> (L)	Setup Time, HIGH or LOW D <sub>n</sub> to LE	2.0		2.0		2.0		ns
		2.0		2.0		2.0		
t <sub>h</sub> (H) t <sub>h</sub> (L)	Hold Time, HIGH or LOW D <sub>n</sub> to LE	3.0		3.0		3.0		ns
		3.0		3.0		3.0		
t <sub>w</sub> (H)	LE Pulse Width, HIGH	4.0		4.0		4.0		ns

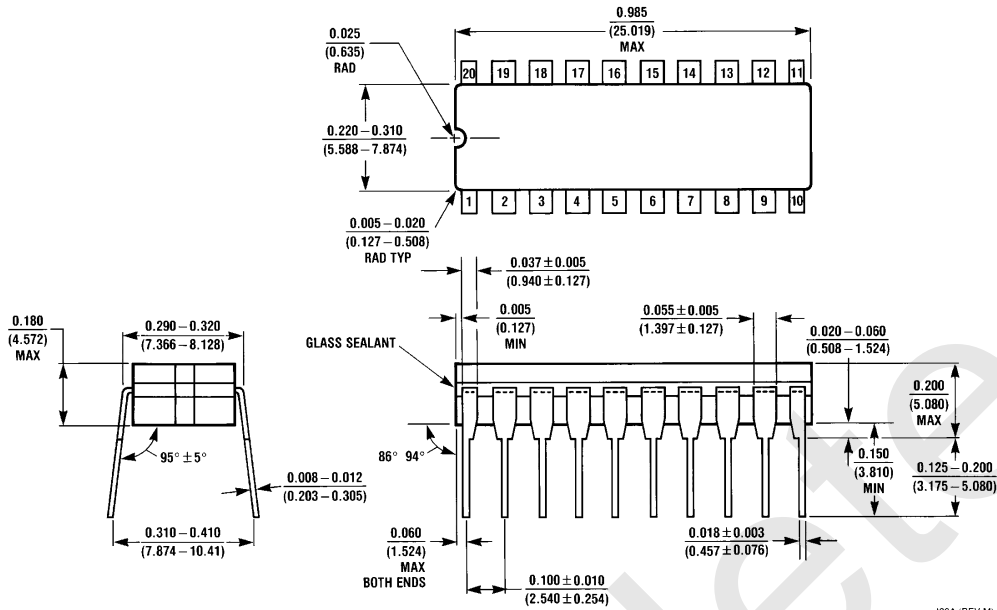
## Ordering Information

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

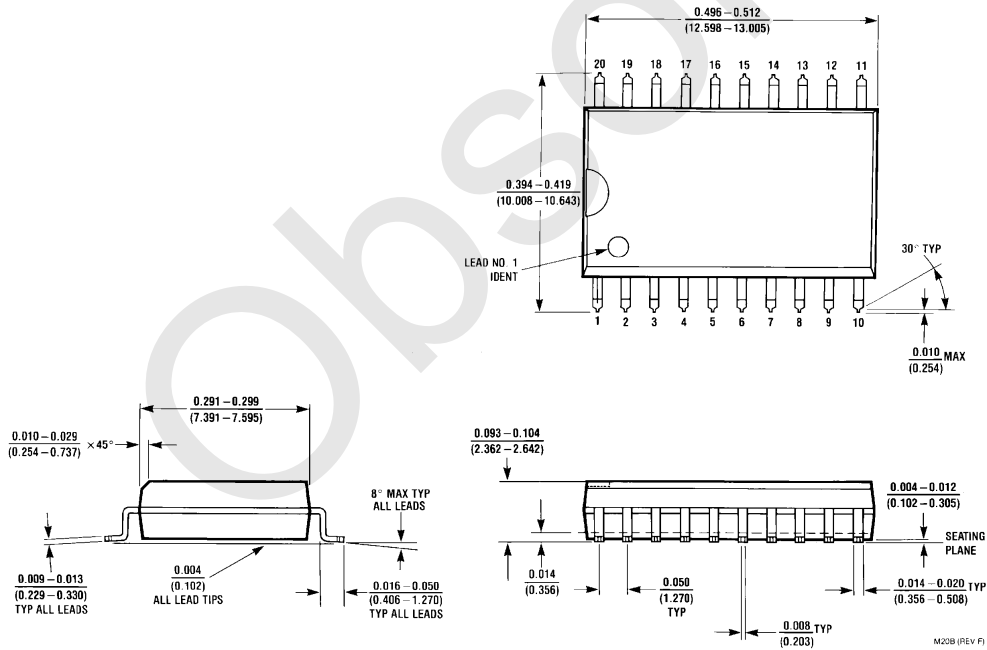




**Physical Dimensions** inches (millimeters) (Continued)

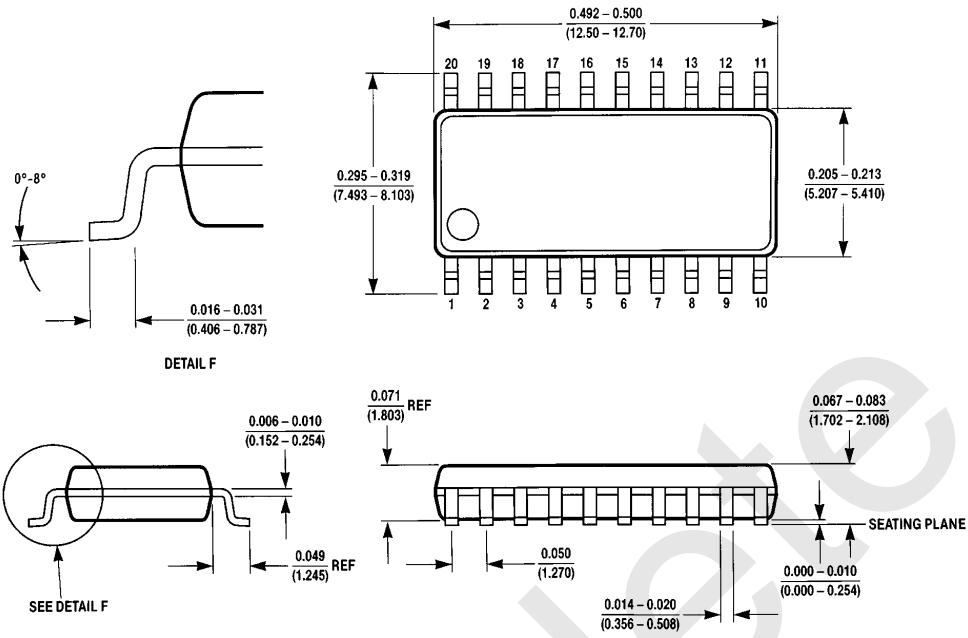


**20-Lead Ceramic Dual-In-Line Package (D)  
 NS Package Number J20A**

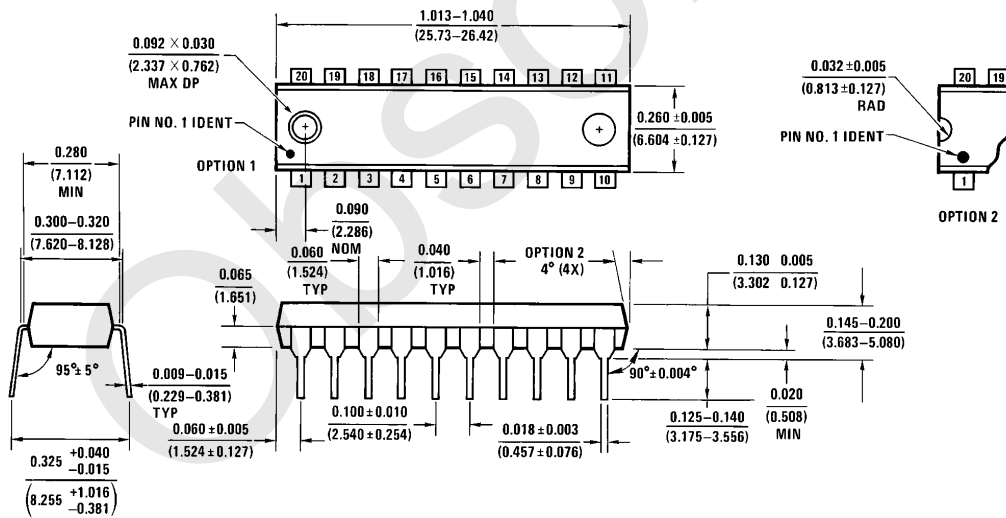


**20-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)  
 NS Package Number M20B**

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

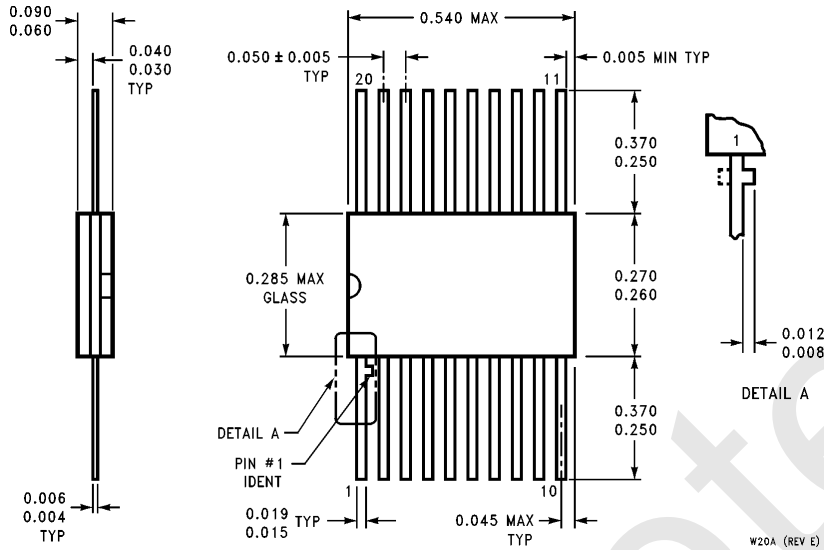


**20-Lead (0.300" Wide) Molded Small Outline Package, EIAJ  
NS Package Number M20D**



**20-Lead (0.300" Wide) Molded Dual-In-Line Package (P)  
NS Package Number N20A**

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



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

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