

## 54F/74F273 Octal D Flip-Flop

### General Description

The 'F273 has eight edge-triggered D-type flip-flops with individual D inputs and Q outputs. The common buffered Clock (CP) and Master Reset ( $\overline{MR}$ ) inputs load and reset (clear) all flip-flops simultaneously.

The register is fully edge-triggered. The state of each D input, one setup time before the LOW-to-HIGH clock transition, is transferred to the corresponding flip-flop's Q output.

All outputs will be forced LOW independently of Clock or Data inputs by a LOW voltage level on the  $\overline{MR}$  input. The device is useful for applications where the true output only is required and the Clock and Master Reset are common to all storage elements.

### Features

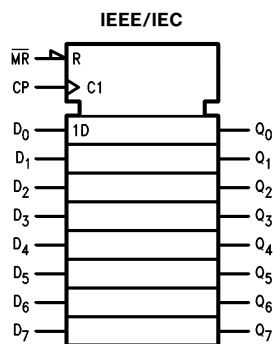
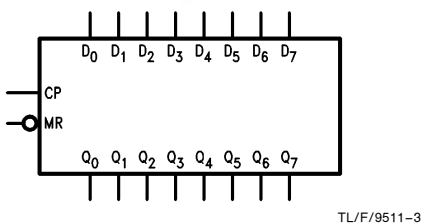
- Ideal buffer for MOS microprocessor or memory
- Eight edge-triggered D flip-flops
- Buffered common clock
- Buffered, asynchronous Master Reset
- See 'F377 for clock enable version
- See 'F373 for transparent latch version
- See 'F374 for TRI-STATE® version
- Guaranteed 4000V minimum ESD protection

Commercial	Military	Package Number	Package Description
74F273PC		N20A	20-Lead (0.300" Wide) Molded Dual-In-Line
	54F273DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
74F273SC (Note 1)		M20B	20-Lead (0.300" Wide) Molded Small Outline, JEDEC
74F273SJ (Note 1)		M20D	20-Lead (0.300" Wide) Molded Small Outline, EIAJ
	54F273FM (Note 2)	W20A	20-Lead Cerpack
	54F273LM (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.

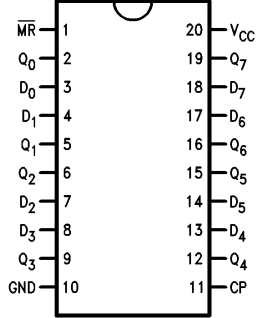
### Logic Symbols



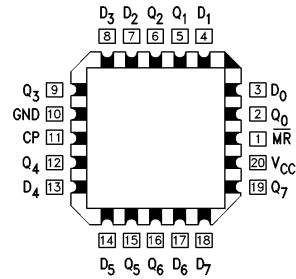
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## Connection Diagrams

Pin Assignment for DIP, SOIC and Flatpak



Pin Assignment for LCC



TL/F/9511-2

TL/F/9511-1

## Unit Loading/Fan Out

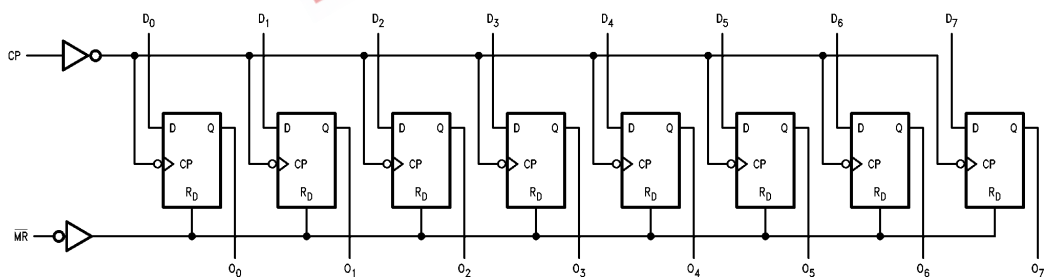
Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input I <sub>IH</sub> /I <sub>IL</sub> Output I <sub>OH</sub> /I <sub>OL</sub>
D <sub>0</sub> -D <sub>7</sub>	Data Inputs	1.0/1.0	20 μA/ -0.6 mA
$\overline{\text{MR}}$	Master Reset (Active LOW)	1.0/1.0	20 μA/ -0.6 mA
CP	Clock Pulse Input (Active Rising Edge)	1.0/1.0	20 μA/ -0.6 mA
Q <sub>0</sub> -Q <sub>7</sub>	Data Outputs	50/33.3	-1 mA/20 mA

Mode Select-Function Table

Operating Mode	Inputs			Output
	$\overline{\text{MR}}$	CP	D <sub>n</sub>	Q <sub>n</sub>
Reset (Clear)	L	X	X	L
Load '1'	H		h	H
Load '0'	H		l	L

H = HIGH Voltage Level steady state  
h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH clock transition  
L = LOW Voltage Level steady state  
l = LOW Voltage Level one setup time prior to the LOW-to-HIGH clock transition  
X = Immaterial  
 = LOW-to-HIGH clock transition

## Logic Diagram



TL/F/9511-4

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)
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			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	Mil 10% V <sub>CC</sub> 5% V <sub>CC</sub>	2.5 2.5 2.7		V	Min	I <sub>OH</sub> = -1 mA
V <sub>OL</sub>	Output LOW Voltage	Mil 10% V <sub>CC</sub> 5% V <sub>CC</sub>		0.5 0.5 0.5	V	Min	I <sub>OL</sub> = 20 mA
I <sub>IH</sub>	Input HIGH Current	54F 74F		20.0 5.0	μA	Max	V <sub>IN</sub> = 2.7V
I <sub>BVI</sub>	Input HIGH Current Breakdown Test	54F 74F		100 7.0	μA	Max	V <sub>IN</sub> = 7.0V
I <sub>CEX</sub>	Output HIGH Leakage Current	54F 74F		250 50	μA	Max	V <sub>OUT</sub> = V <sub>CC</sub>
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>ID</sub> = 150 mV All other pins grounded
I <sub>IL</sub>	Input LOW Current			-0.6	mA	Max	V <sub>IN</sub> = 0.5V
I <sub>OS</sub>	Output Short-Circuit Current		-60	-150	mA	Max	V <sub>OUT</sub> = 0V
I <sub>CCH</sub> I <sub>CCL</sub>	Power Supply Current			44 56	mA	Max	CP =  D <sub>n</sub> = $\overline{MR}$ = HIGH

## AC Electrical Characteristics

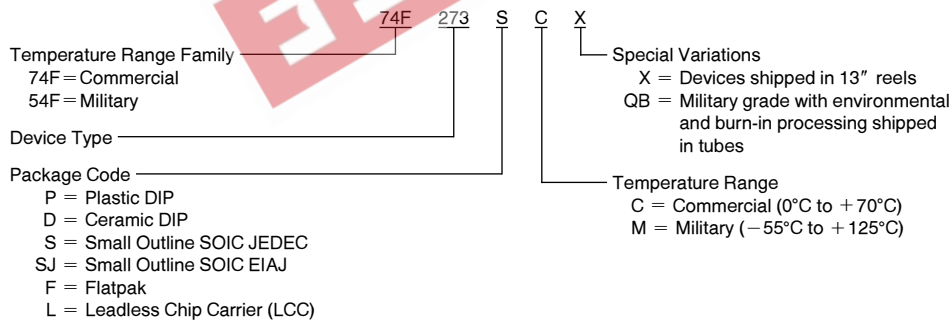
Symbol	Parameter	74F			54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
f <sub>max</sub>	Maximum Clock Frequency	160			95		130		MHz
t <sub>PLH</sub>	Propagation Delay	3.0		7.0	2.5	9.5	2.5	7.5	ns
t <sub>PHL</sub>	Clock to Output	4.0		9.00	3.0	11.0	3.5	9.0	
t <sub>PLH</sub>	Propagation Delay	4.5		9.5	3.0	11.0	4.0	10.0	ns
t <sub>PHL</sub>	$\overline{MR}$ to Output								

## AC Operating Requirements

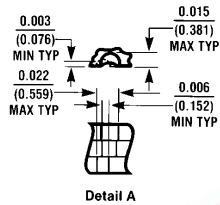
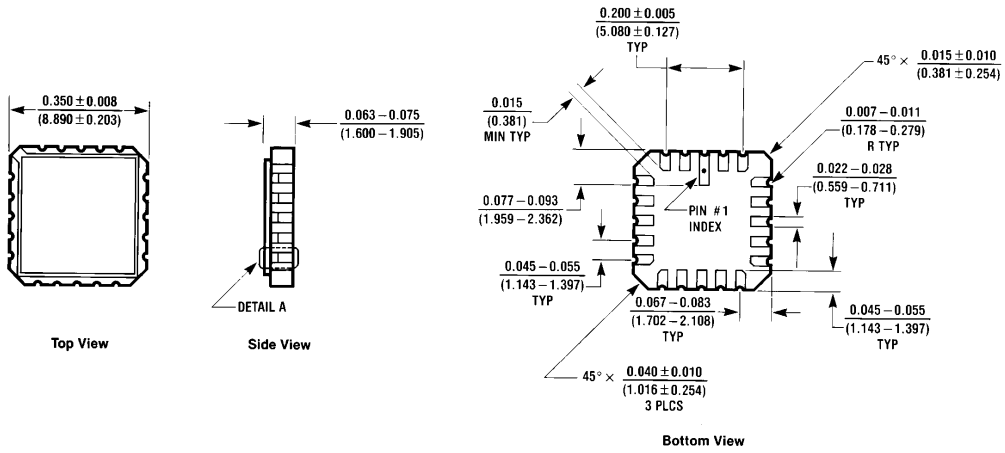
Symbol	Parameter	74F		54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V		T <sub>A</sub> , V <sub>CC</sub> = Mil		T <sub>A</sub> , V <sub>CC</sub> = Com		
		Min	Max	Min	Max	Min	Max	
t <sub>s</sub> (H)	Setup Time, HIGH or LOW	3.0		3.5		3.0		ns
t <sub>s</sub> (L)	Data to CP	3.5		4.0		3.5		
t <sub>h</sub> (H)	Hold Time, HIGH or LOW	0.5		1.0		0.5		ns
t <sub>h</sub> (L)	Data to CP	1.0		1.0		1.0		
t <sub>w</sub> (L)	$\overline{MR}$ Pulse Width, LOW	6.0		4.0		6.0		ns
t <sub>w</sub> (H)	CP Pulse Width	6.0		5.0		6.0		ns
t <sub>w</sub> (L)	HIGH or LOW	6.0		5.0		6.0		
t <sub>rec</sub>	Recovery Time, $\overline{MR}$ to CP	3.0		4.5		3.5		ns

## Ordering Information

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

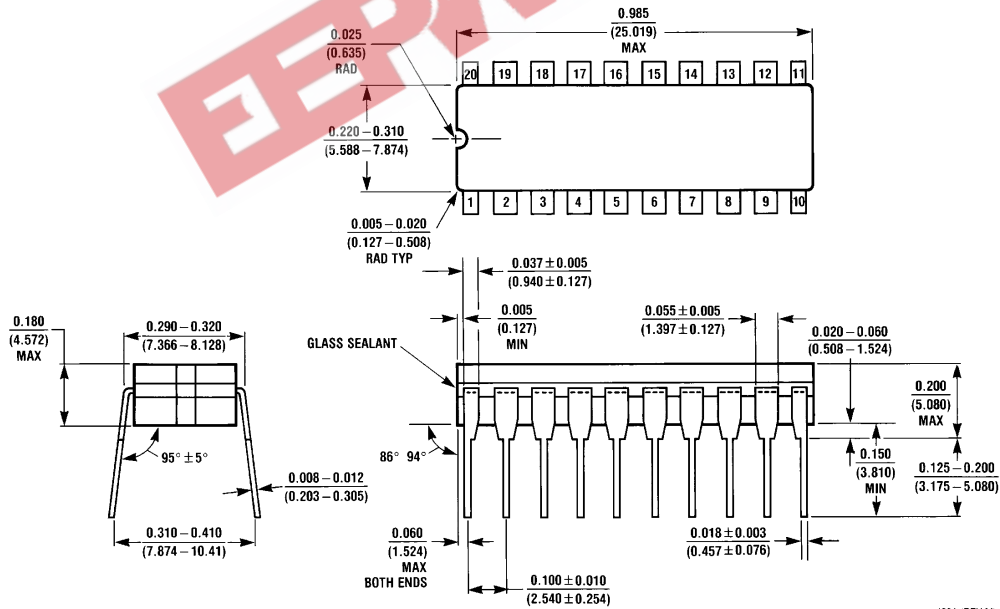


**Physical Dimensions** inches (millimeters)



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

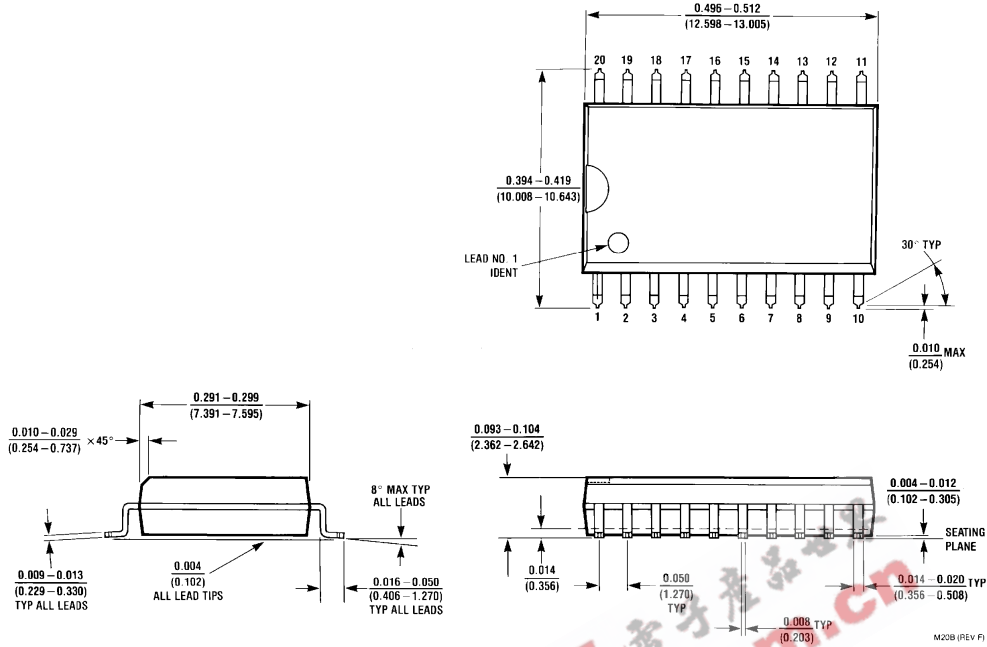
E20A (REV D)



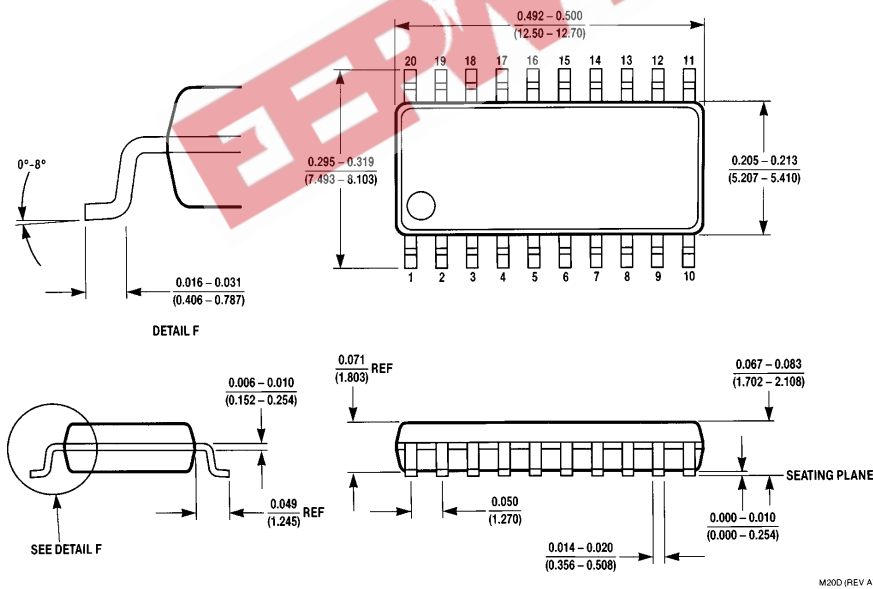
**20-Lead Ceramic Dual-In-Line Package (D)**  
 NS Package Number J20A

J20A (REV M)

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



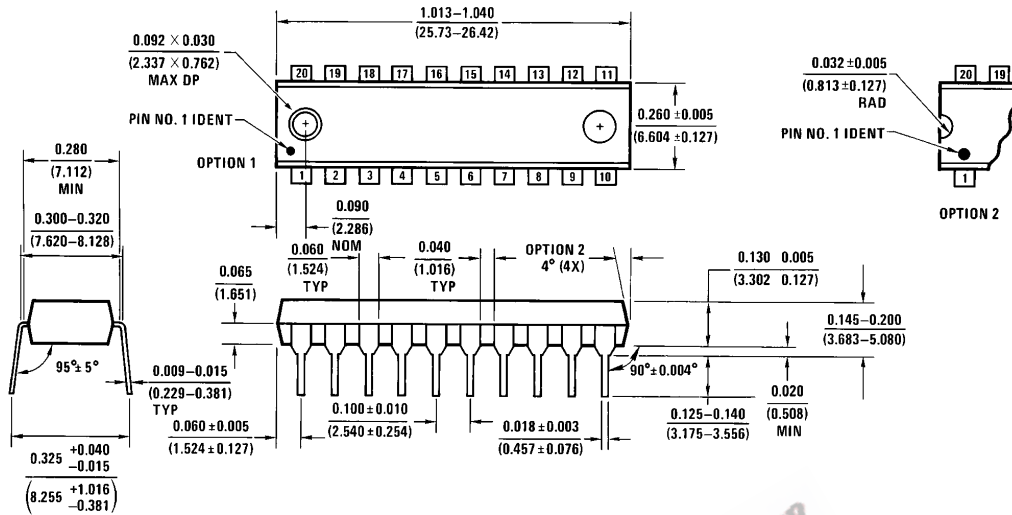
**20-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M20B**



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

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

Lit. # 114645

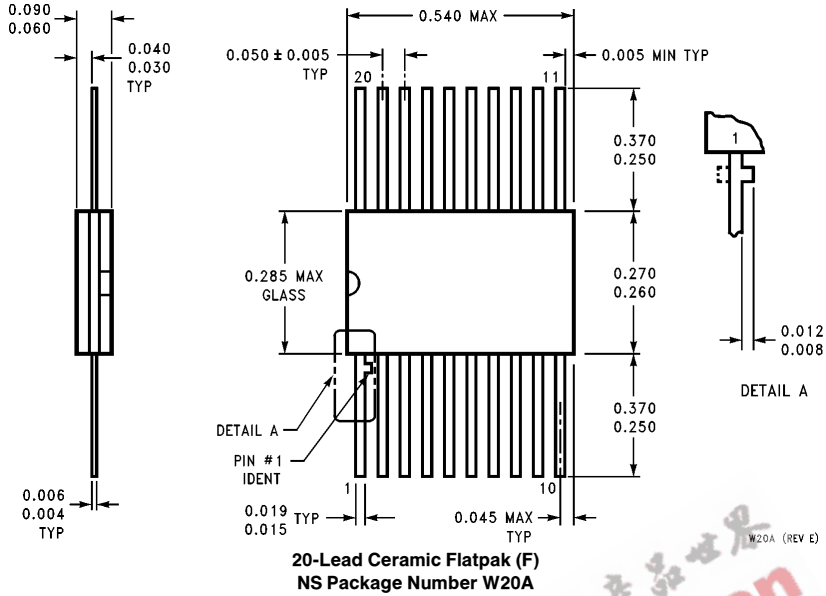


20-Lead (0.300" Wide) Molded Dual-In-Line Package (P)  
NS Package Number N20A

N20A (REV G)

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



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