

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

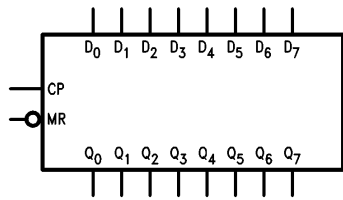
- Ideal buffer for MOS microprocessor or memory
- Eight edge-triggered D flip-flops
- Buffered common clock
- Buffered, asynchronous Master Reset
- See 'F377 for clock enable version
- See 'F373 for transparent latch version
- See 'F374 for TRI-STATE® version
- Guaranteed 4000V minimum ESD protection

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

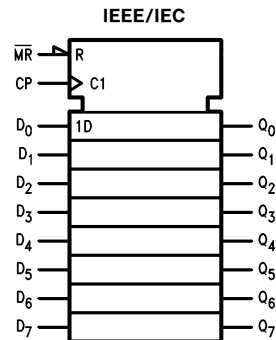
Note 1: Devices also available in 13" reel. Use suffix = SCX and SJX.

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

Logic Symbols



TL/F/9511-3

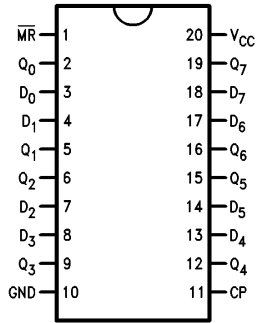


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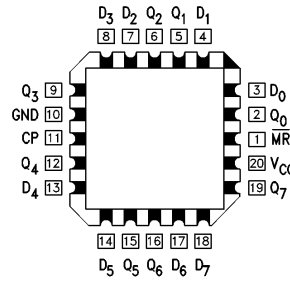
TRI-STATE® is a registered trademark of National Semiconductor Corporation.

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

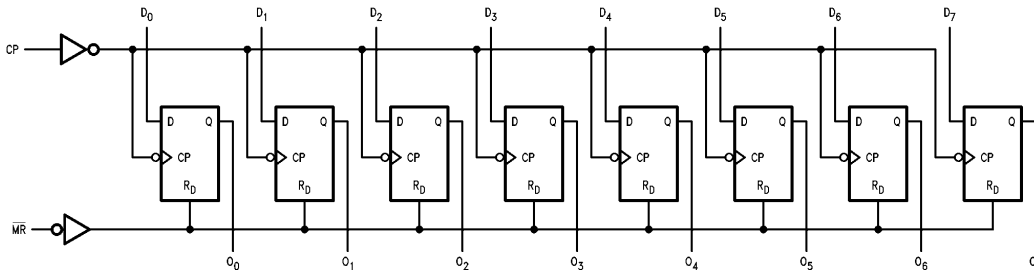
Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
D_0-D_7	Data Inputs	1.0/1.0	$20 \mu\text{A}/-0.6 \text{ mA}$
$\overline{\text{MR}}$	Master Reset (Active LOW)	1.0/1.0	$20 \mu\text{A}/-0.6 \text{ mA}$
CP	Clock Pulse Input (Active Rising Edge)	1.0/1.0	$20 \mu\text{A}/-0.6 \text{ mA}$
Q_0-Q_7	Data Outputs	50/33.3	$-1 \text{ mA}/20 \text{ mA}$

Mode Select-Function Table

Operating Mode	Inputs			Output
	$\overline{\text{MR}}$	CP	D_n	Q_n
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



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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 _{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	
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 _{CC}	Conditions
			Min	Typ	Max			
V _{IH}	Input HIGH Voltage		2.0			V		Recognized as a HIGH Signal
V _{IL}	Input LOW Voltage		0.8			V		Recognized as a LOW Signal
V _{CD}	Input Clamp Diode Voltage		-1.2			V	Min	I _{IN} = -18 mA
V _{OH}	Output HIGH Voltage	Mil	2.5		V	Min	I _{OH} = -1 mA	
		10% V _{CC}	2.5					
		5% V _{CC}	2.7					
V _{OL}	Output LOW Voltage	Mil	0.5		V	Min	I _{OL} = 20 mA	
		10% V _{CC}	0.5					
		5% V _{CC}	0.5					
I _{IH}	Input HIGH Current	54F	20.0		μA	Max	V _{IN} = 2.7V	
		74F	5.0					
I _{BVI}	Input HIGH Current Breakdown Test	54F	100		μA	Max	V _{IN} = 7.0V	
		74F	7.0					
I _{CEX}	Output HIGH Leakage Current	54F	250		μA	Max	V _{OUT} = V _{CC}	
		74F	50					
V _{ID}	Input Leakage Test	74F	4.75		V	0.0	I _{ID} = 1.9 μA All other pins grounded	
I _{OD}	Output Leakage Circuit Current	74F	3.75		μA	0.0	V _{IOD} = 150 mV All other pins grounded	
I _{IL}	Input LOW Current		-0.6		mA	Max	V _{IN} = 0.5V	
I _{OS}	Output Short-Circuit Current		-60	-150	mA	Max	V _{OUT} = 0V	
I _{CCH} I _{CCL}	Power Supply Current		44		mA	Max	CP =  D _n = \overline{MR} = HIGH	
			56					

AC Electrical Characteristics

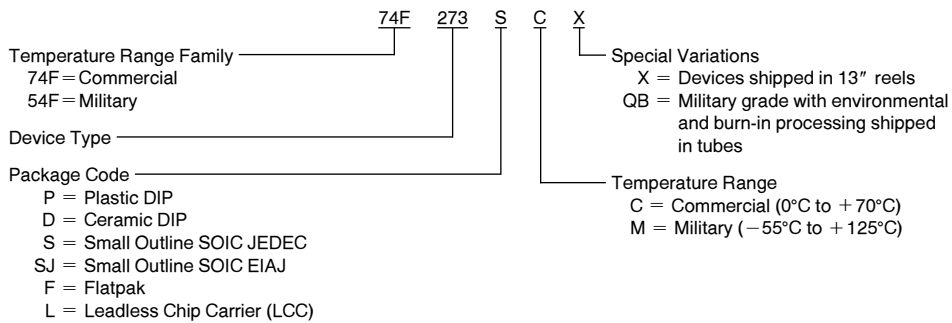
Symbol	Parameter	74F			54F		74F		Units
		T _A = +25°C V _{CC} = +5.0V C _L = 50 pF			T _A , V _{CC} = Mil C _L = 50 pF		T _A , V _{CC} = Com C _L = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
f _{max}	Maximum Clock Frequency	160			95		130		MHz
t _{PLH} t _{PHL}	Propagation Delay Clock to Output	3.0		7.0	2.5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

AC Operating Requirements

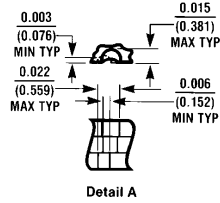
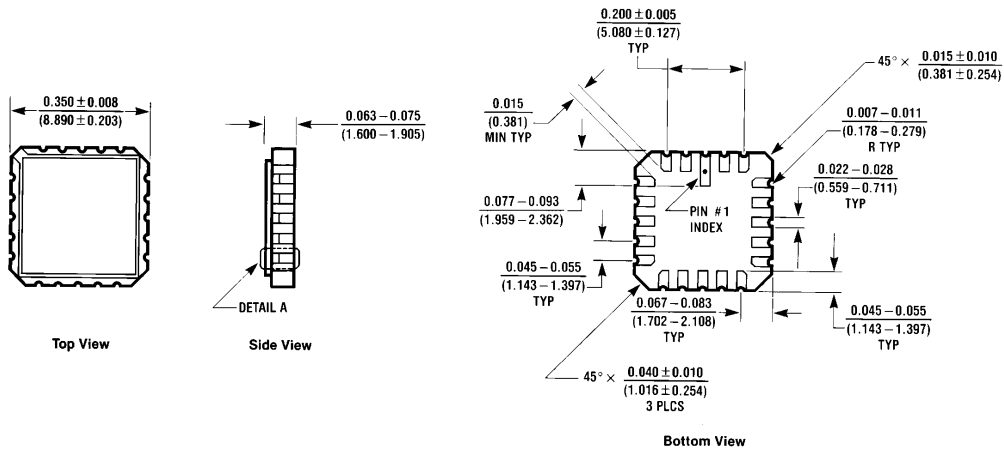
Symbol	Parameter	74F		54F		74F		Units
		T _A = +25°C V _{CC} = +5.0V		T _A , V _{CC} = Mil		T _A , V _{CC} = Com		
		Min	Max	Min	Max	Min	Max	
t _s (H) t _s (L)	Setup Time, HIGH or LOW Data to CP	3.0		3.5		3.0		ns
		3.5		4.0		3.5		
t _h (H) t _h (L)	Hold Time, HIGH or LOW Data to CP	0.5		1.0		0.5		ns
		1.0		1.0		1.0		
t _w (L)	MR Pulse Width, LOW	6.0		4.0		6.0		ns
t _w (H) t _w (L)	CP Pulse Width HIGH or LOW	6.0		5.0		6.0		ns
		6.0		5.0		6.0		
t _{rec}	Recovery Time, 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:

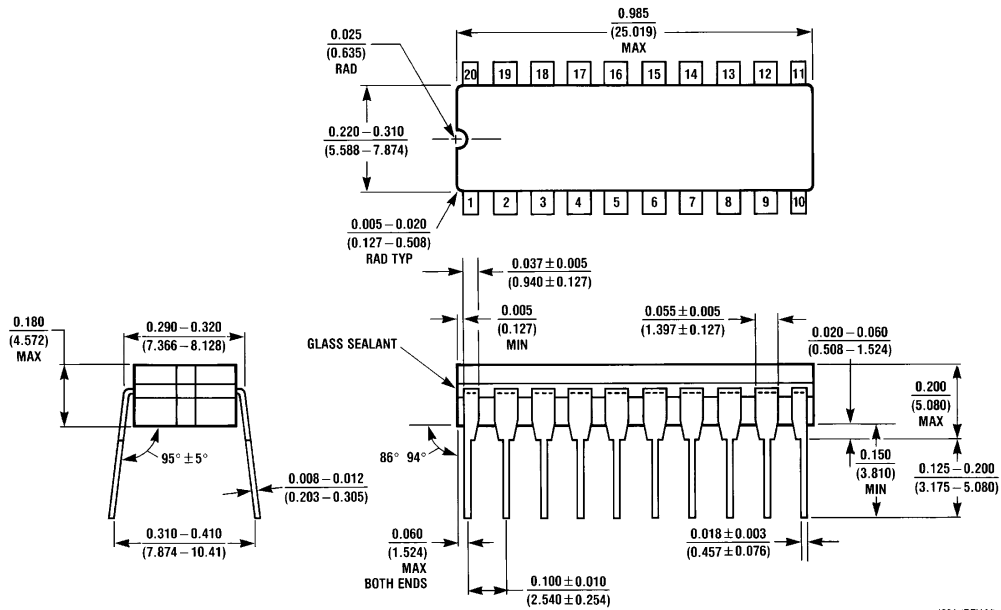


Physical Dimensions inches (millimeters)



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

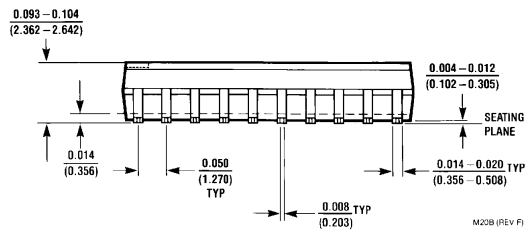
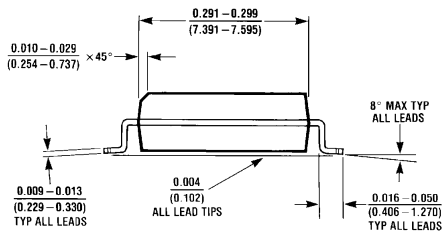
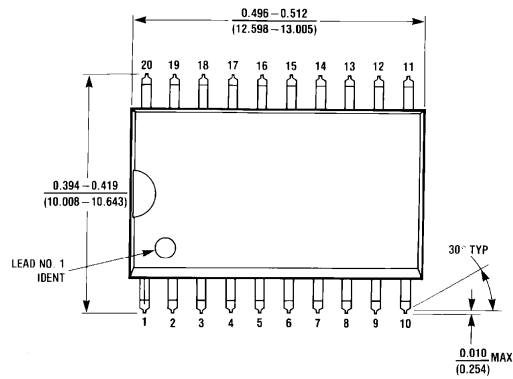
E20A (REV D)



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

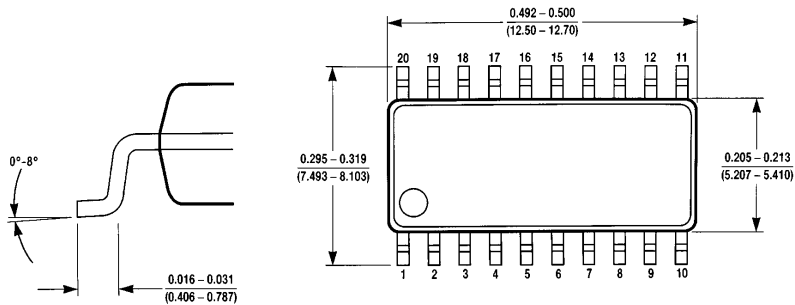
J20A (REV M)

Physical Dimensions inches (millimeters) (Continued)

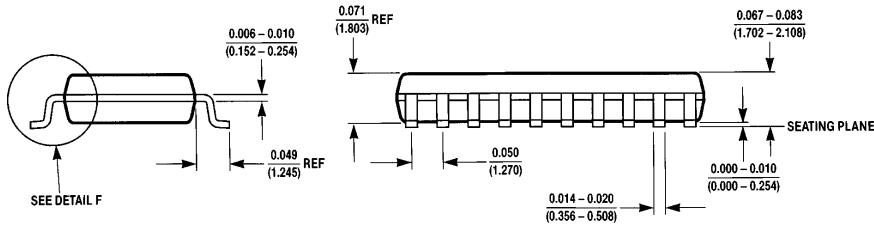


M20B (REV F)

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



DETAIL F



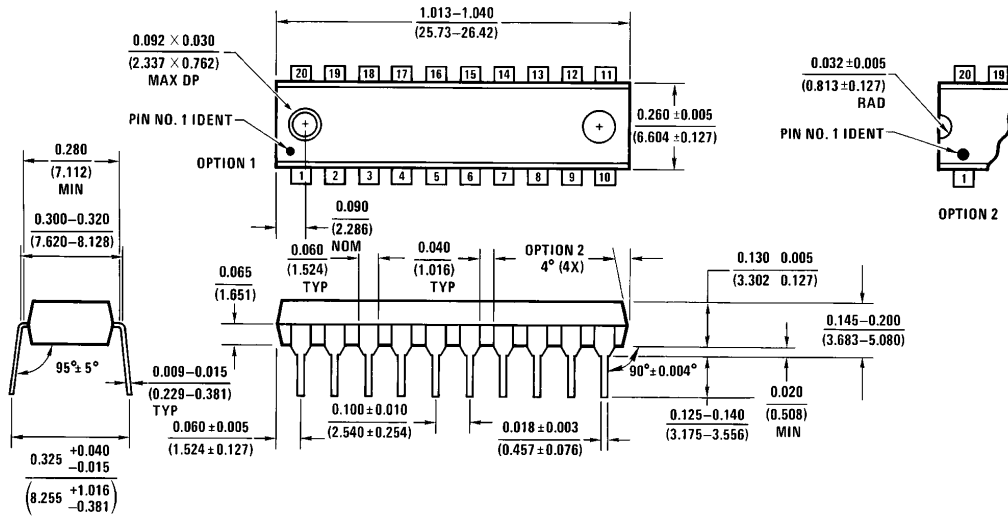
SEE DETAIL F

M20D (REV A)

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

Physical Dimensions inches (millimeters) (Continued)

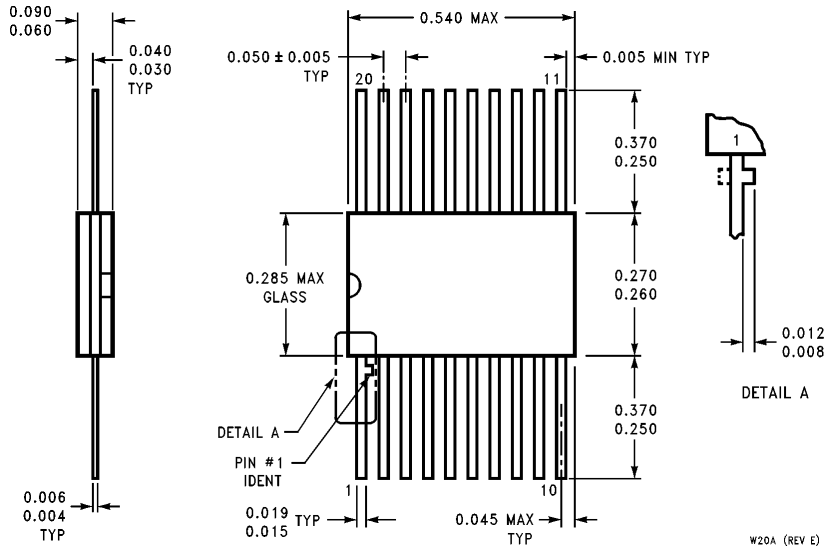
Lit. # 114645



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

N20A (REV G)

Physical Dimensions inches (millimeters) (Continued)



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

W20A (REV E)

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