

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

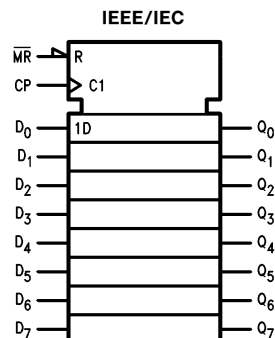
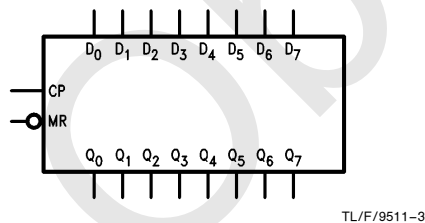
- Ideal buffer for MOS microprocessor or memory
- Eight edge-triggered D flip-flops
- Buffered common clock
- Buffered, asynchronous Master Reset
- See 'F377 for clock enable version
- See 'F373 for transparent latch version
- See 'F374 for TRI-STATE® version
- Guaranteed 4000V minimum ESD protection

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.

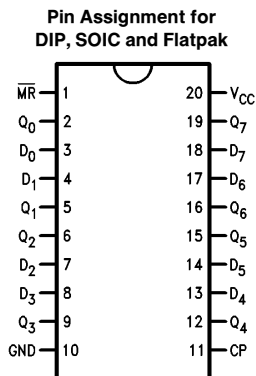
Note 2: Military grade device with environmental and burn-in processing. Use suffix = DMQB, FMQB and LMQB.

Logic Symbols

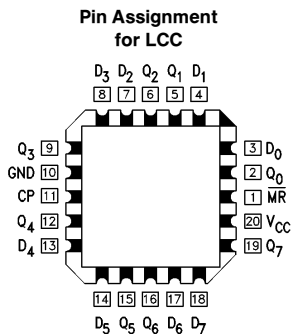


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Connection Diagrams



TL/F/9511-1



TL/F/9511-2

Unit Loading/Fan Out

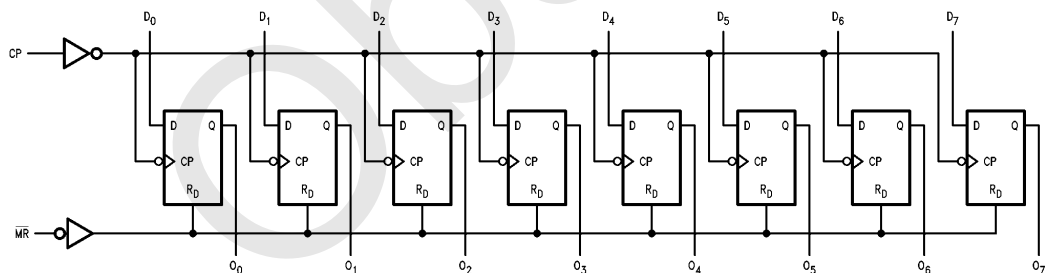
Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input I _{IH} /I _{IL} Output I _{OH} /I _{OL}
D ₀ –D ₇	Data Inputs	1.0/1.0	20 μA/–0.6 mA
MR	Master Reset (Active LOW)	1.0/1.0	20 μA/–0.6 mA
CP	Clock Pulse Input (Active Rising Edge)	1.0/1.0	20 μA/–0.6 mA
Q ₀ –Q ₇	Data Outputs	50/33.3	–1 mA/20 mA

Mode Select-Function Table

Operating Mode	Inputs			Output
	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



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 _{CC} Pin Potential to Ground Pin	−0.5V to +7.0V
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Input Voltage (Note 2)	−0.5V to +7.0V
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Input Current (Note 2)	−30 mA to +5.0 mA
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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)
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ESD Last Passing Voltage (min)	4000V
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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 10% V _{CC} 5% V _{CC}	2.5 2.5 2.7		V	Min	I _{OH} = −1 mA
V _{OL}	Output LOW Voltage	Mil 10% V _{CC} 5% V _{CC}		0.5 0.5 0.5	V	Min	I _{OL} = 20 mA
I _{IH}	Input HIGH Current	54F 74F		20.0 5.0	μA	Max	V _{IN} = 2.7V
I _{BVI}	Input HIGH Current Breakdown Test	54F 74F		100 7.0	μA	Max	V _{IN} = 7.0V
I _{CEX}	Output HIGH Leakage Current	54F 74F		250 50	μA	Max	V _{OUT} = V _{CC}
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 56	mA	Max	CP =  D _n =  = HIGH

AC Electrical Characteristics

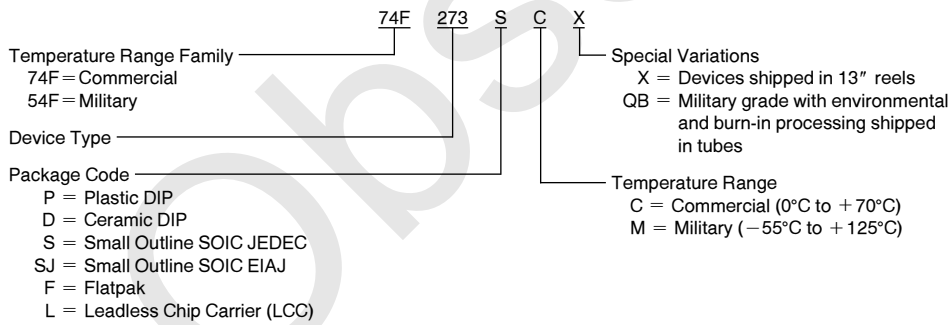
Symbol	Parameter	74F			54F		74F		Units
		$T_A = +25^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$ $C_L = 50\text{ pF}$			$T_A, V_{CC} = \text{Mil}$ $C_L = 50\text{ pF}$		$T_A, V_{CC} = \text{Com}$ $C_L = 50\text{ pF}$		
		Min	Typ	Max	Min	Max	Min	Max	
f _{max}	Maximum Clock Frequency	160			95		130		MHz
t _{PLH}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

AC Operating Requirements

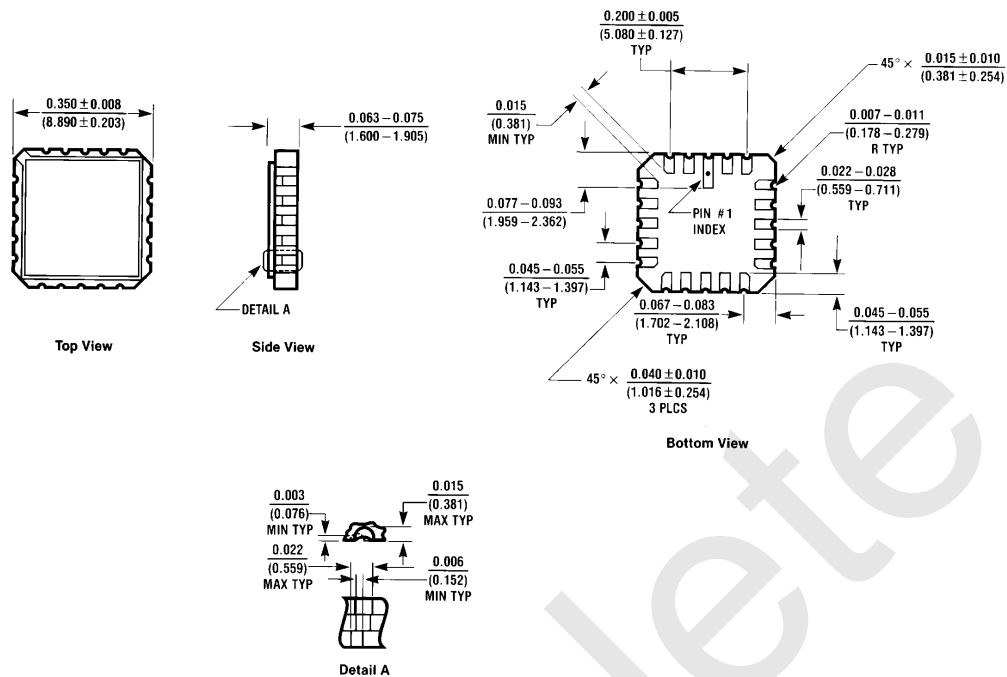
Symbol	Parameter	74F		54F		74F		Units
		$T_A = +25^{\circ}\text{C}$ $V_{CC} = +5.0\text{V}$		$T_A, V_{CC} = \text{Mil}$		$T_A, V_{CC} = \text{Com}$		
		Min	Max	Min	Max	Min	Max	
$t_s(\text{H})$ $t_s(\text{L})$	Setup Time, HIGH or LOW Data to CP	3.0 3.5		3.5 4.0		3.0 3.5		ns
$t_h(\text{H})$ $t_h(\text{L})$	Hold Time, HIGH or LOW Data to CP	0.5 1.0		1.0 1.0		0.5 1.0		
$t_w(\text{L})$	$\overline{\text{MR}}$ Pulse Width, LOW	6.0		4.0		6.0		ns
$t_w(\text{H})$ $t_w(\text{L})$	CP Pulse Width HIGH or LOW	6.0 6.0		5.0 5.0		6.0 6.0		ns
t_{rec}	Recovery Time, $\overline{\text{MR}}$ 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:

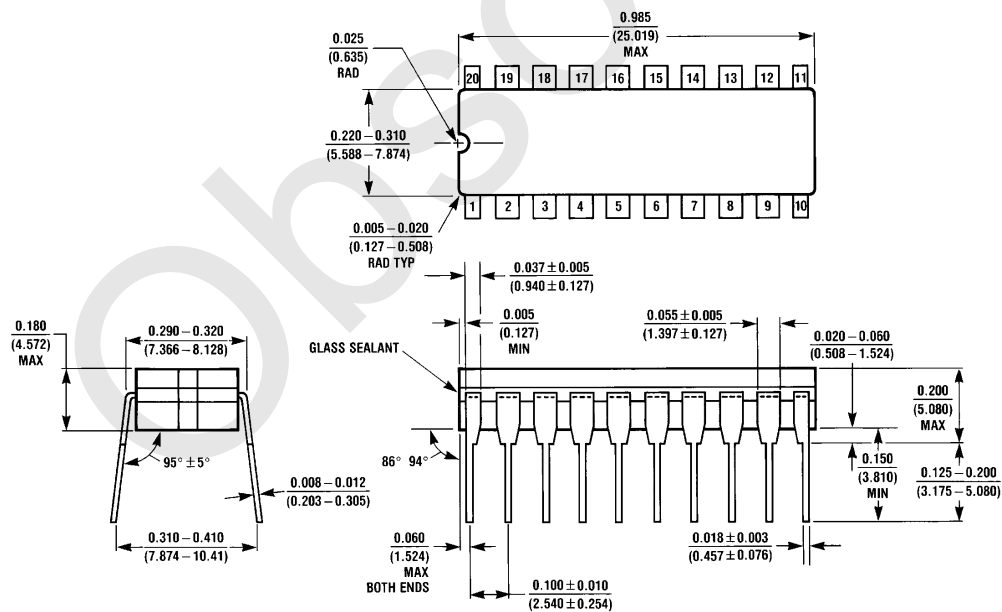


Physical Dimensions inches (millimeters)



E20A (REV D)

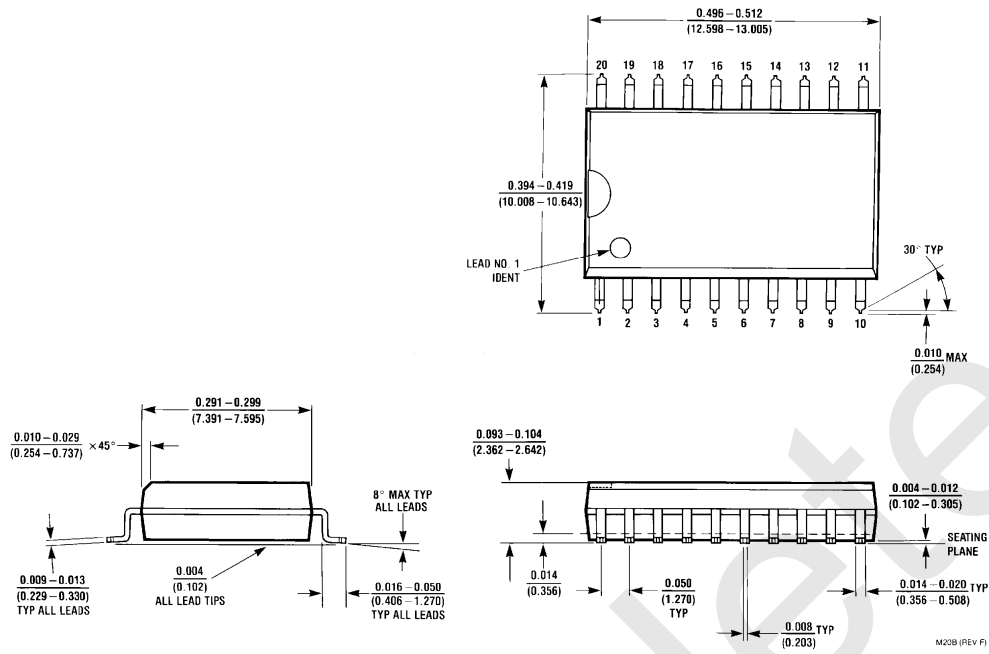
**20-Lead Ceramic Leadless Chip Carrier (LCC)
NS Package Number E20A**



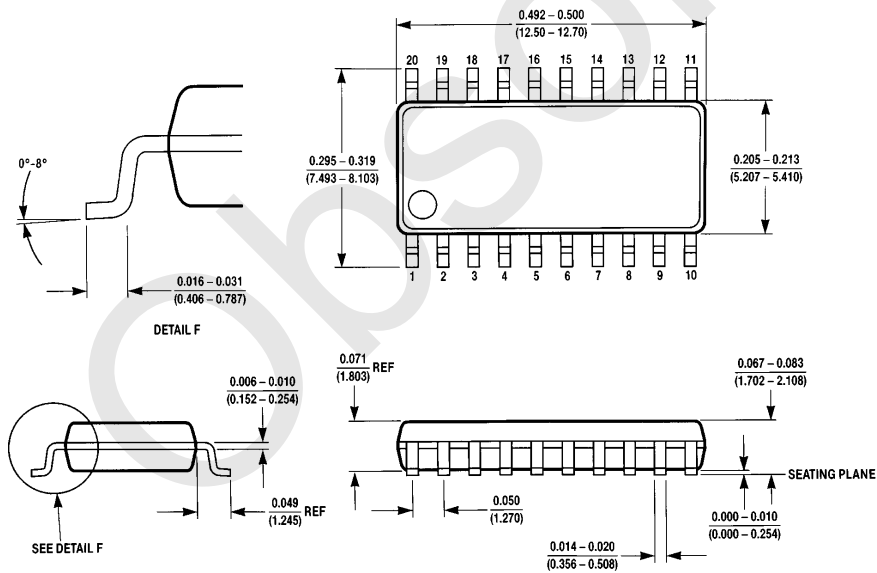
J20A (REV M)

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

Physical Dimensions inches (millimeters) (Continued)



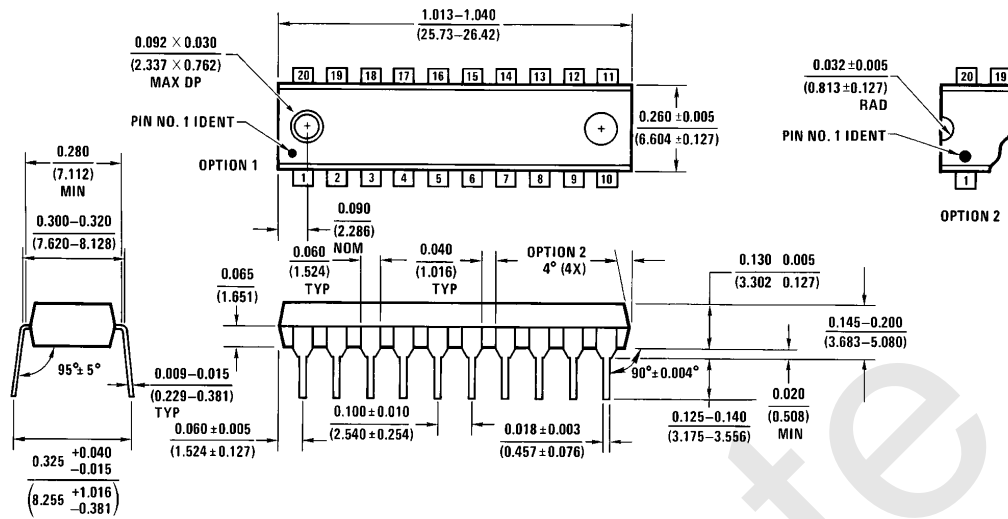
20-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)
NS Package Number M20B



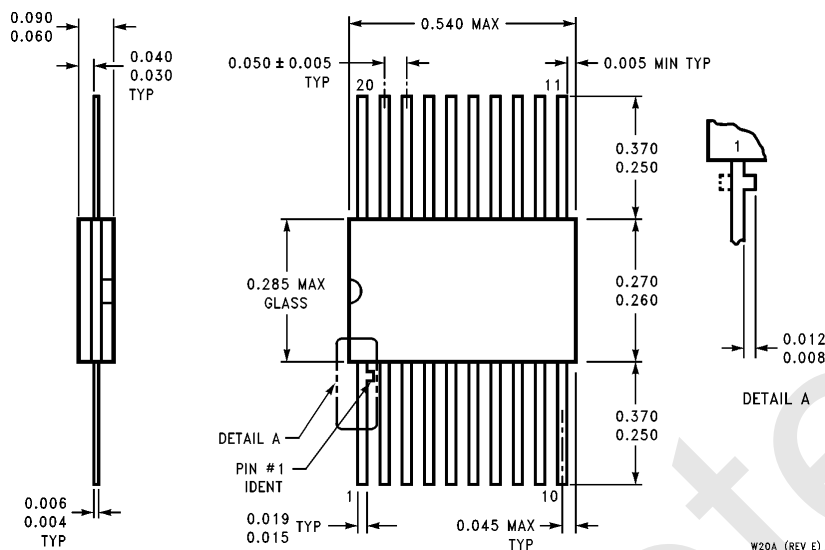
20-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)
NS Package Number M20D

Physical Dimensions inches (millimeters) (Continued)

Lit. # 114645



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

Physical Dimensions inches (millimeters) (Continued)

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

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