

## 54F/74F521 8-Bit Identity Comparator

### General Description

The '521 is an expandable 8-bit comparator. It compares two words of up to eight bits each and provides a LOW output when the two words match bit for bit. The expansion input  $\bar{I}_{A=B}$  also serves as an active LOW enable input.

### Features

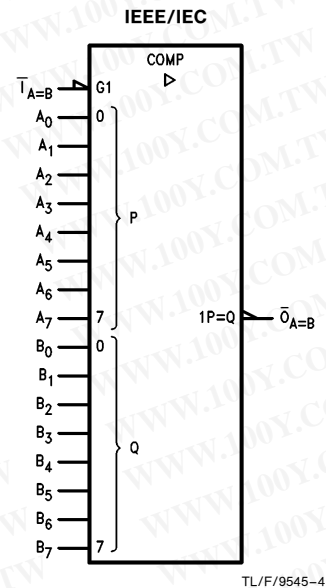
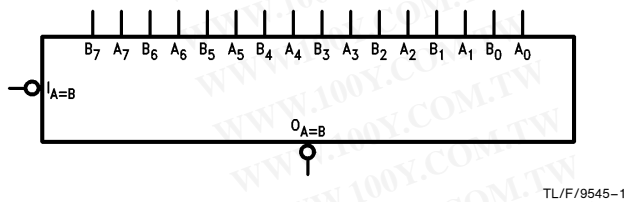
- Compares two 8-bit words in 6.5 ns typ
- Expandable to any word length
- 20-pin package

Commercial	Military	Package Number	Package Description
74F521PC		N20A	20-Lead (0.300" Wide) Molded Dual-In-Line
	54F521DM (Note 2)	J20A	20-Lead Ceramic Dual-In-Line
74F521SC (Note 1)		M20B	20-Lead (0.300" Wide) Molded Small Outline, JEDEC
74F521SJ (Note 1)		M20D	20-Lead (0.300" Wide) Molded Small Outline, EIAJ
74F521MSA (Note 1)		MSA20	20-Lead Molded Shrink Small Outline, EIAJ type II

**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 = DMOB.

### Logic Symbols



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## Unit Loading/Fan Out

Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
A <sub>0</sub> -A <sub>7</sub>	Word A Inputs	1.0/1.0	20 $\mu$ A/ -0.6 mA
B <sub>0</sub> -B <sub>7</sub>	Word B Inputs	1.0/1.0	20 $\mu$ A/ -0.6 mA
$\bar{I}_A=B$	Expansion or Enable Input (Active LOW)	1.0/1.0	20 $\mu$ A/ -0.6 mA
$\bar{O}_A=B$	Identity Output (Active LOW)	50/33.3	-1 mA/20 mA

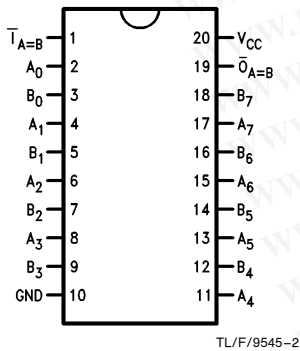
## Truth Table

Inputs		Output
$\bar{I}_A=B$	A, B	$\bar{O}_A=B$
L	A = B*	L
L	A $\neq$ B	H
H	A = B*	H
H	A $\neq$ B	H

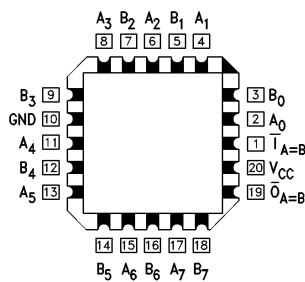
H = HIGH Voltage Level  
L = LOW Voltage Level  
\*A<sub>0</sub> = B<sub>0</sub>, A<sub>1</sub> = B<sub>1</sub>, A<sub>2</sub> = B<sub>2</sub>, etc.

## Connection Diagrams

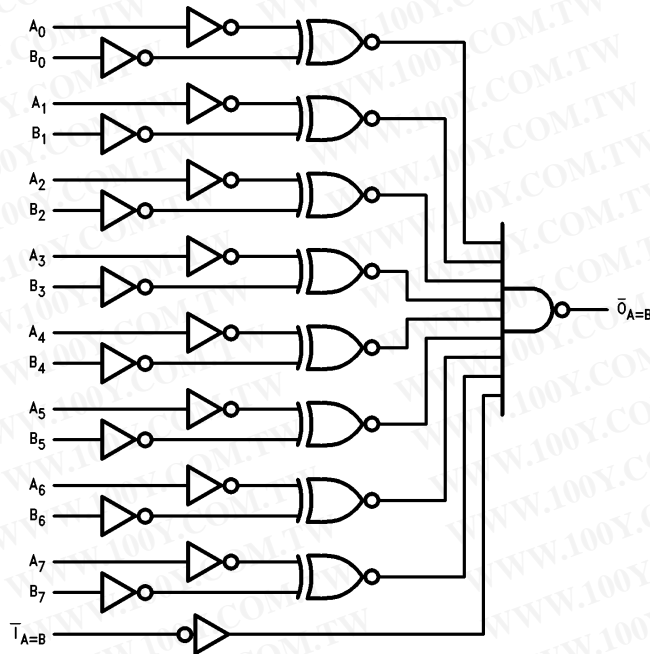
Pin Assignment for DIP, SOIC, SSOP and Flatpak



Pin Assignment for LCC



## Logic Diagram



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

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## 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

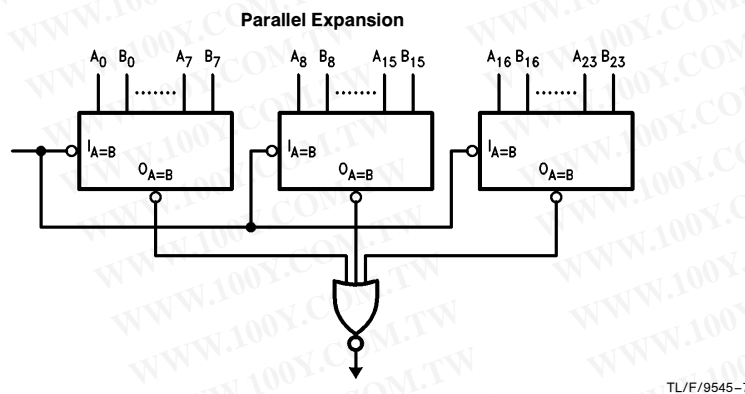
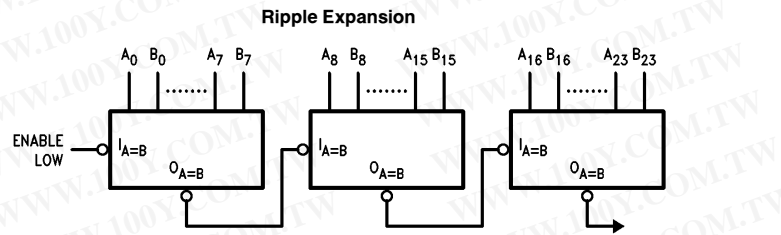
Symbol	Parameter	54F/74F			Units	V <sub>CC</sub>	Conditions	
		Min	Typ	Max				
V <sub>IH</sub>	Input HIGH Voltage	2.0			V		Recognized as a HIGH Signal	
V <sub>IL</sub>	Input LOW Voltage			0.8	V		Recognized as a LOW Signal	
V <sub>CD</sub>	Input Clamp Diode Voltage			-1.2	V	Min	I <sub>IN</sub> = -18 mA	
V <sub>OH</sub>	Output HIGH Voltage	54F 10% V <sub>CC</sub>	2.5		V	Min	I <sub>OH</sub> = -1 mA I <sub>OH</sub> = -1 mA I <sub>OH</sub> = -1 mA	
		74F 10% V <sub>CC</sub>	2.5					
		74F 5% V <sub>CC</sub>	2.7					
V <sub>OL</sub>	Output LOW Voltage	54F 10% V <sub>CC</sub>		0.5	V	Min	I <sub>OL</sub> = 20 mA I <sub>OL</sub> = 20 mA	
		74F 10% V <sub>CC</sub>		0.5				
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			-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>	Power Supply Current		21	32	mA	Max	V <sub>O</sub> = HIGH	

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## AC Electrical Characteristics

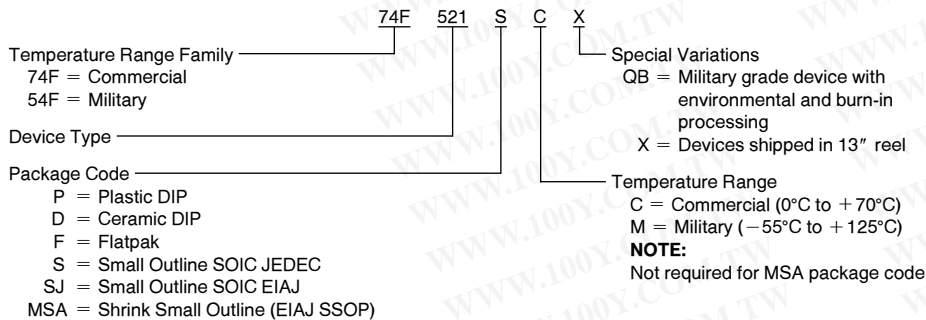
Symbol	Parameter	74F			54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay	3.0	7.0	10.0	3.0	14.0	3.0	11.0	ns
t <sub>PHL</sub>	A <sub>n</sub> or B <sub>n</sub> to $\overline{O}_{A=B}$	4.5	7.0	10.0	4.0	15.0	4.0	11.0	
t <sub>PLH</sub>	Propagation Delay	3.0	5.0	6.5	3.0	8.5	3.0	7.5	ns
t <sub>PHL</sub>	$\overline{I}_{A=B}$ to $\overline{O}_{A=B}$	3.5	6.5	9.0	3.5	13.5	3.5	10.0	

## Applications

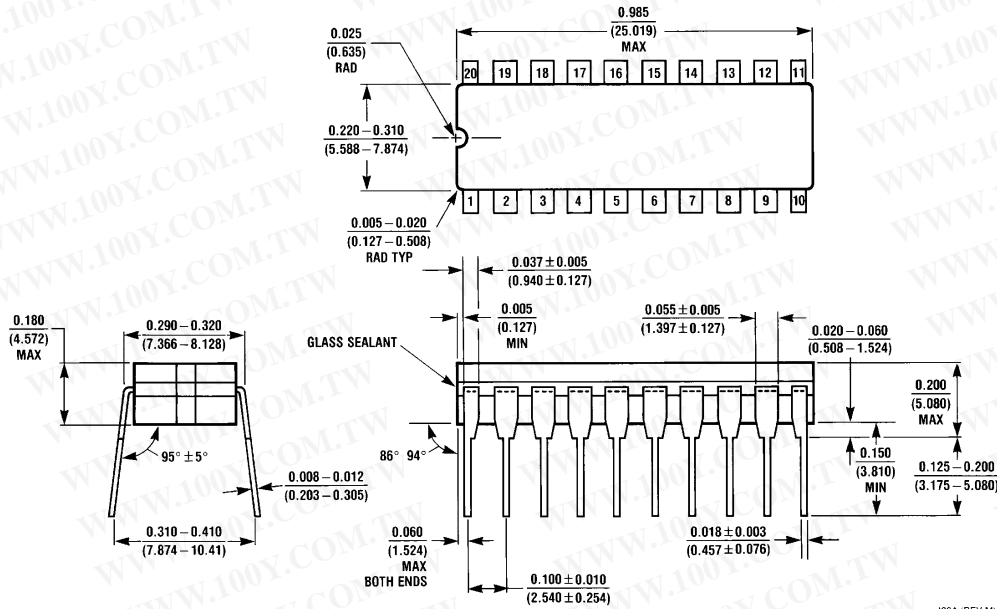


## Ordering Information

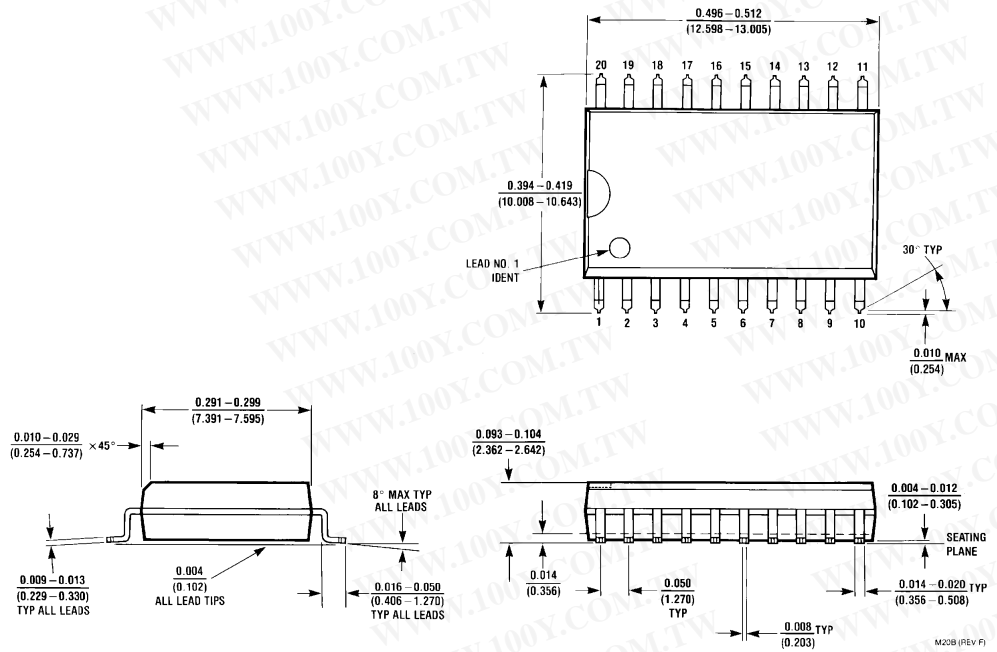
The device number is used to form part of a simplified purchasing code where the package type and temperature range are defined as follows:



**Physical Dimensions** inches (millimeters)

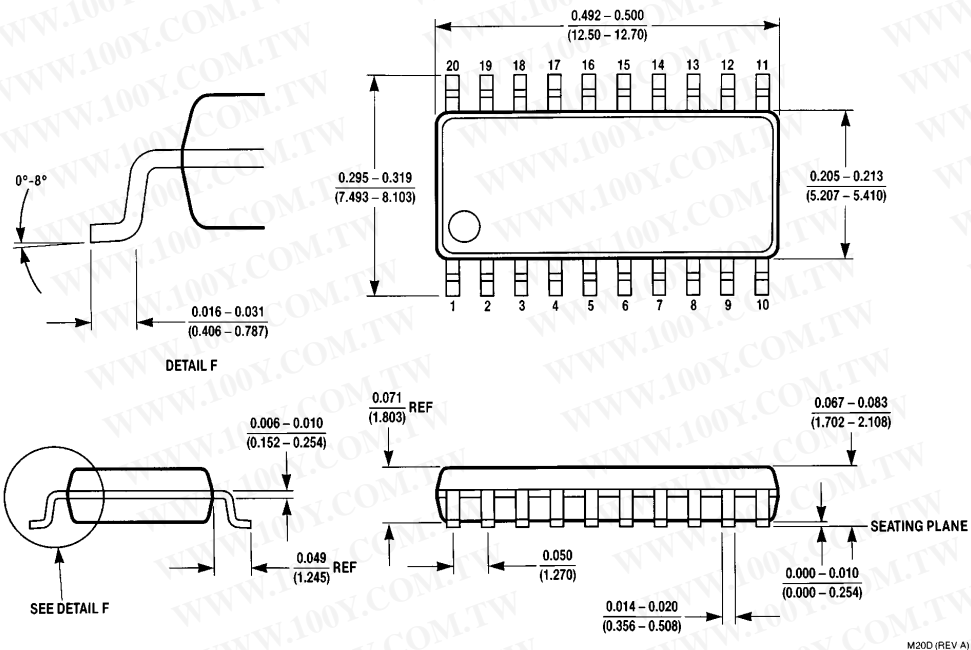


**20-Lead Ceramic Dual-In-Line Package (D)  
NS Package Number J20A**

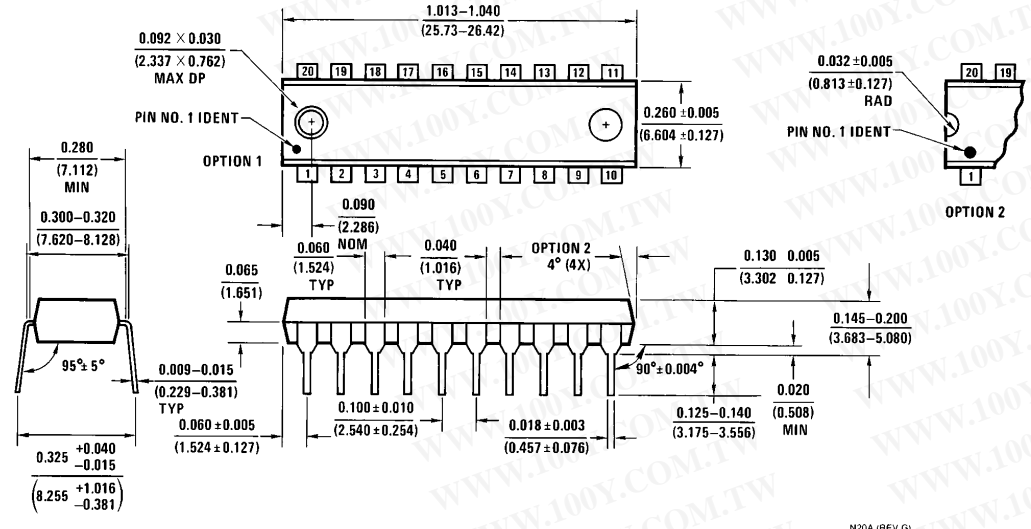


**20-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M20B**

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

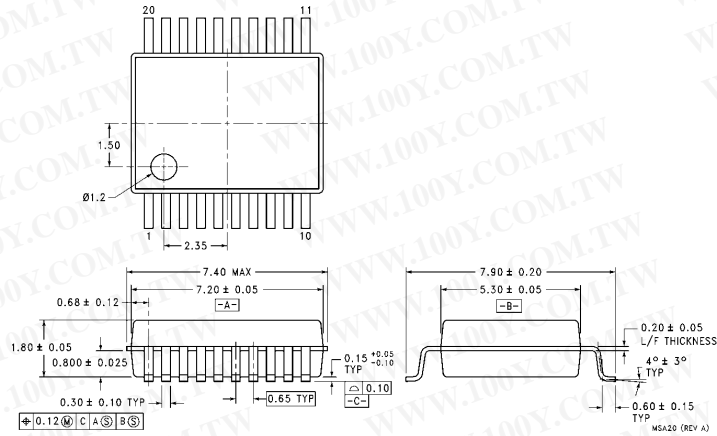


**20-Lead (0.300" Wide) Molded Small Outline Package, EIAJ (SJ)  
NS Package Number M20D**



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

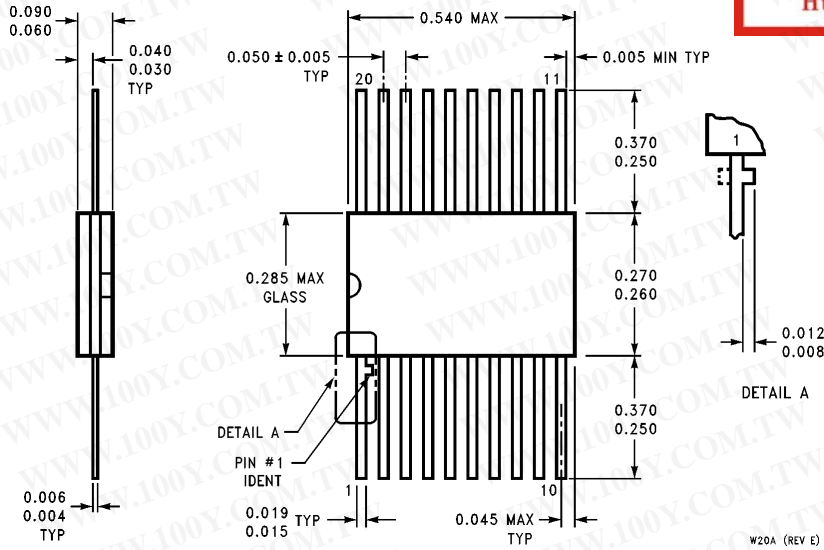
**Physical Dimensions** inches (millimeters) (Continued)



**20-Lead (0.300" Wide) Molded Shrink Outline Package, EIAJ, Type II (MSA)**  
**NS Package Number MSA20**

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



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

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