

## 29F52•29F53 8-Bit Registered Transceiver

### General Description

The 29F52 and 29F53 are 8-bit registered transceivers. Two 8-bit back to back registers store data flowing in both directions between two bidirectional buses. Separate clock, clock enable and TRI-STATE® output enable signals are provided for each register. The A<sub>0</sub>–A<sub>7</sub> output pins are guaranteed to sink 24 mA (20 mA mil.) while the B<sub>0</sub>–B<sub>7</sub> output pins are designed for 64 mA.

The 29F53 is an inverting option of the 29F52. Both transceivers are AMD Am2952/2953 functional equivalents.

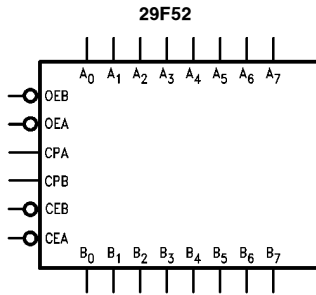
### Features

- 8-bit registered transceivers
- Separate clock, clock enable and TRI-STATE output enable provided for each register
- AMD Am2952/2953 functional equivalents
- Both inverting and non-inverting options available
- 24-Pin slimline package

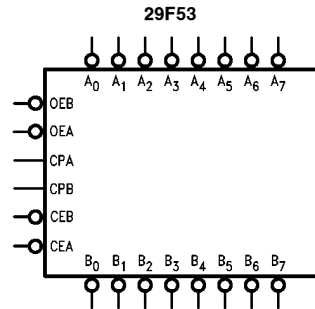
Commercial	Package Number	Package Description
29F52SPC	N24C	24-Lead (0.300" Wide) Molded Dual-In-Line
29F52SC (Note 1)	M24B	24-Lead (0.300" Wide) Molded Small Outline, JEDEC
29F53SPC	N24C	24-Lead (0.300" Wide) Molded Dual-In-Line

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

### Logic Symbols



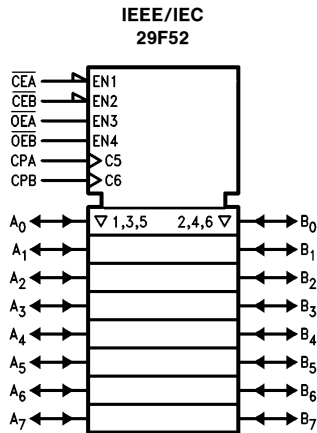
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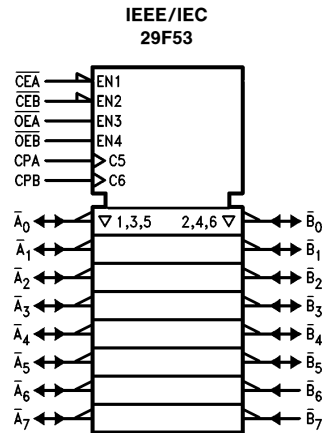
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## Logic Symbols (Continued)

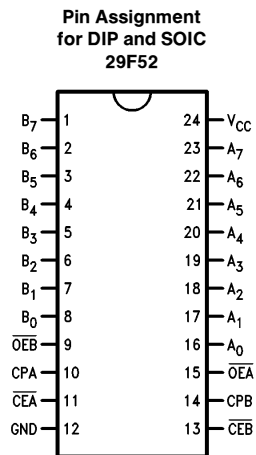


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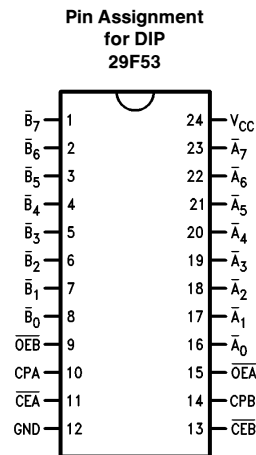


TL/F/9606-5

## Connection Diagrams



TL/F/9606-2

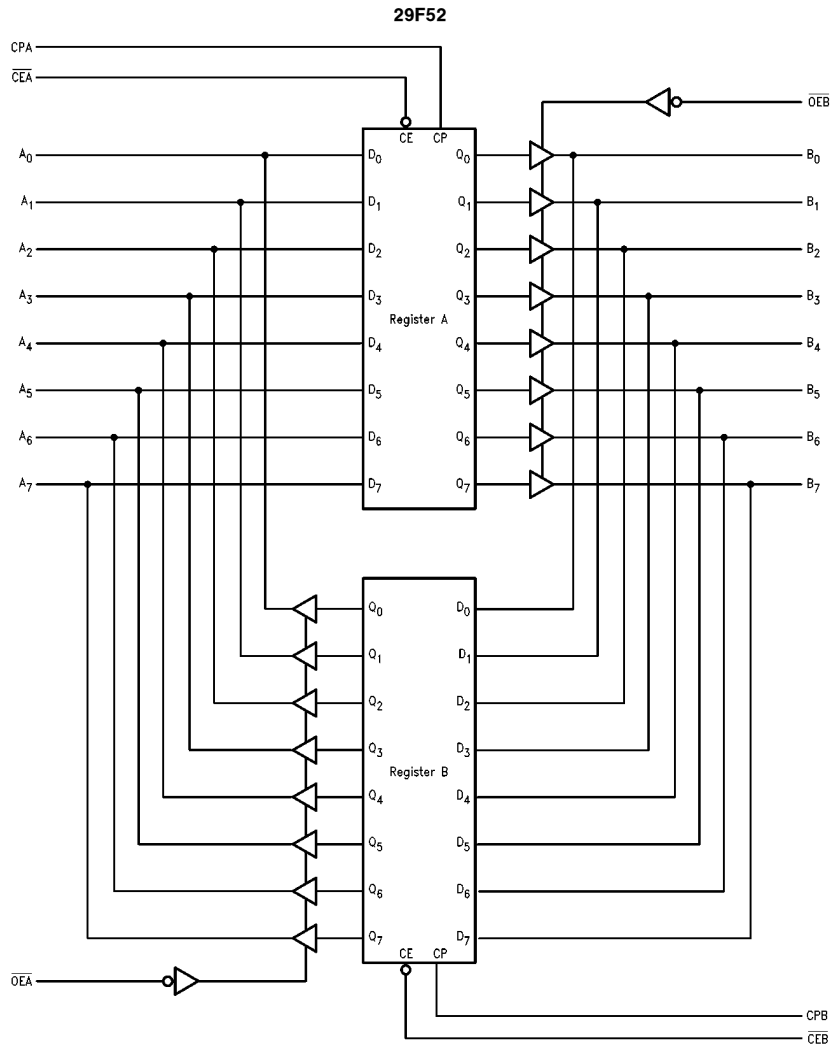


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## Unit Loading/Fan Out

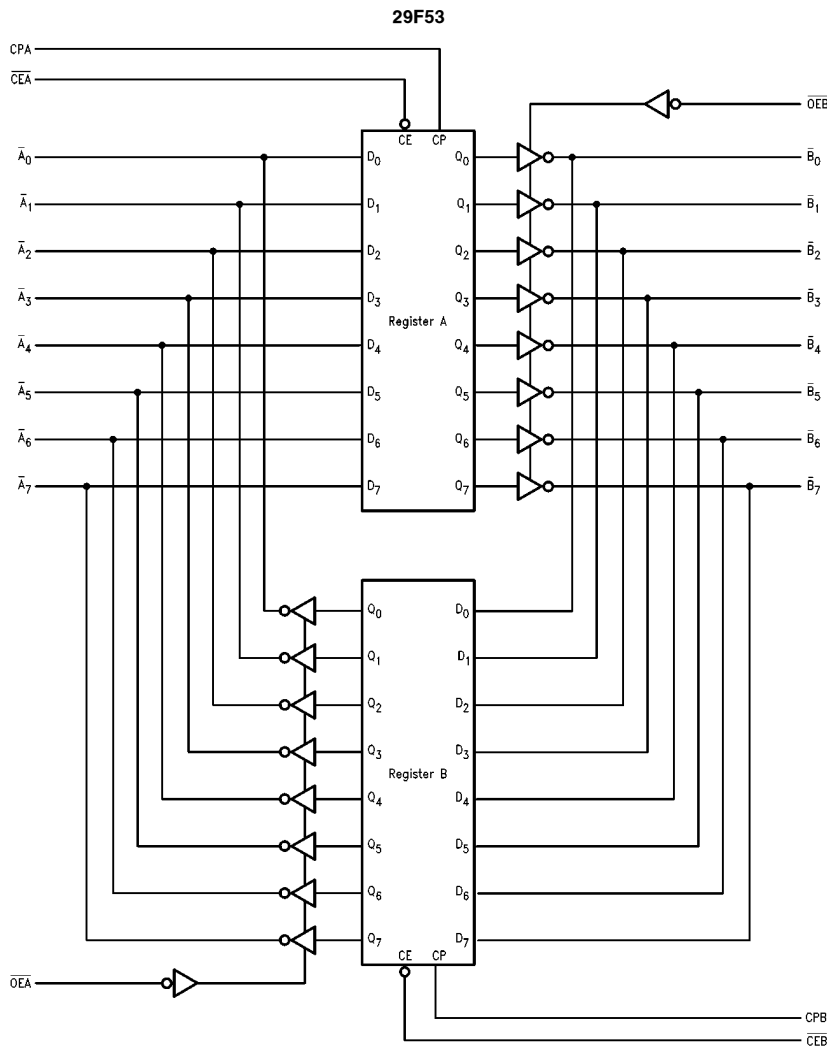
Pin Names	Description	54F/74F	
		U.L. HIGH/LOW	Input $I_{IH}/I_{IL}$ Output $I_{OH}/I_{OL}$
A <sub>0</sub> -A <sub>7</sub>	A-Register Inputs/ B-Register TRI-STATE Outputs	3.5/1.083	70 $\mu$ A/0.65 mA -3 mA/24 mA (20 mA)
B <sub>0</sub> -B <sub>7</sub>	B Register Inputs/ A-Register TRI-STATE Outputs	3.5/1.083	70 $\mu$ A/0.65 mA -12 mA/64 mA (48 mA)
$\overline{OEA}$	Output Enable A-Register	1.0/1.0	20 $\mu$ A/ -0.6 mA
CPA	A-Register Clock	1.0/1.0	20 $\mu$ A/ -0.6 mA
$\overline{CEA}$	A-Register Clock Enable	1.0/1.0	20 $\mu$ A/ -0.6 mA
$\overline{OEB}$	Output Enable B-Register	1.0/1.0	20 $\mu$ A/ -0.6 mA
CPB	B-Register Clock	1.0/1.0	20 $\mu$ A/ -0.6 mA
$\overline{CEB}$	B-Register Clock Enable	1.0/1.0	20 $\mu$ A/ -0.6 mA

## Block Diagrams



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## Block Diagrams (Continued)



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**Output Control**

OE	Internal Q	Y-Output		Function
		29F52	29F53	
H	X	Z	Z	Disable Outputs
L	L	L	H	Enable Outputs
L	H	H	L	

H = HIGH Voltage Level  
 L = LOW Voltage Level  
 X = Immaterial  
 Z = HIGH Impedance  
 ↗ = LOW-to-HIGH Transition  
 NC = No Change

**Register Function Table (Applies to A or B Register)**

Inputs			Internal Q	Function
D	CP	CE		
X	X	H	NC	Hold Data
L	↗	L	L	Load Data
H	↗	L	H	

## 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 (Non I/O Pins)	
V <sub>OH</sub>	Output HIGH Voltage	54F 10% V <sub>CC</sub>	2.5		V	Min	I <sub>OH</sub> = -1 mA (A <sub>n</sub> )	
		54F 10% V <sub>CC</sub>	2.4				I <sub>OH</sub> = -3 mA (A <sub>n</sub> , B <sub>n</sub> )	
		54F 10% V <sub>CC</sub>	2.0				I <sub>OH</sub> = -12 mA (B <sub>n</sub> )	
		74F 10% V <sub>CC</sub>	2.5				I <sub>OH</sub> = -1 mA (A <sub>n</sub> )	
		74F 10% V <sub>CC</sub>	2.4				I <sub>OH</sub> = -3 mA (A <sub>n</sub> , B <sub>n</sub> )	
		74F 10% V <sub>CC</sub>	2.0				I <sub>OH</sub> = -15 mA (B <sub>n</sub> )	
		74F 5% V <sub>CC</sub>	2.7				I <sub>OH</sub> = -1 mA (A <sub>n</sub> )	
		74F 5% V <sub>CC</sub>	2.7		I <sub>OH</sub> = -3 mA (A <sub>n</sub> , B <sub>n</sub> )			
V <sub>OL</sub>	Output LOW Voltage	54F 10% V <sub>CC</sub>		0.5	V	Min	I <sub>OL</sub> = 20 mA (A <sub>n</sub> )	
		54F 10% V <sub>CC</sub>		0.55			I <sub>OL</sub> = 48 mA (B <sub>n</sub> )	
		74F 10% V <sub>CC</sub>		0.5			I <sub>OL</sub> = 24 mA (A <sub>n</sub> )	
		74F 10% V <sub>CC</sub>		0.55			I <sub>OL</sub> = 64 mA (B <sub>n</sub> )	
I <sub>IH</sub>	Input HIGH Current	20			μA	Max	V <sub>IN</sub> = 2.7V (Non-I/O Pins)	
I <sub>BVI</sub>	Input HIGH Current Breakdown Test	100			μA	Max	V <sub>IN</sub> = 7.0V (Non-I/O Pins)	
I <sub>BVIT</sub>	Input HIGH Current Breakdown Test (I/O)	1.0			mA	Max	V <sub>IN</sub> = 5.5V (A <sub>n</sub> , B <sub>n</sub> )	
I <sub>IL</sub>	Input LOW Current	-0.6			mA	Max	V <sub>IN</sub> = 0.5V (Non-I/O Pins)	
I <sub>IH</sub> + I <sub>OZH</sub>	Output Leakage Current	70			μA	Max	V <sub>OUT</sub> = 2.7V (A <sub>n</sub> , B <sub>n</sub> )	
I <sub>IL</sub> + I <sub>OZL</sub>	Output Leakage Current	-650			μA	Max	V <sub>OUT</sub> = 0.5V (A <sub>n</sub> , B <sub>n</sub> )	
I <sub>OS</sub>	Output Short-Circuit Current	-60	-150		mA	Max	V <sub>OUT</sub> = 0V (A <sub>n</sub> )	
		-100	-225				V <sub>OUT</sub> = 0V (B <sub>n</sub> )	
I <sub>CEX</sub>	Output HIGH Leakage Current	250			μA	Max	V <sub>OUT</sub> = V <sub>CC</sub> (A <sub>n</sub> , B <sub>n</sub> )	
I <sub>ZZ</sub>	Bus Drainage Test	500			μA	0.0V	V <sub>OUT</sub> = 5.25V (A <sub>n</sub> , B <sub>n</sub> )	
I <sub>CCH</sub>	Power Supply Current	130			190	mA	Max	V <sub>O</sub> = HIGH
I <sub>CCL</sub>	Power Supply Current	190			mA	Max	V <sub>O</sub> = LOW	
I <sub>CCZ</sub>	Power Supply Current	190			mA	Max	V <sub>O</sub> = HIGH Z	

## AC Electrical Characteristics

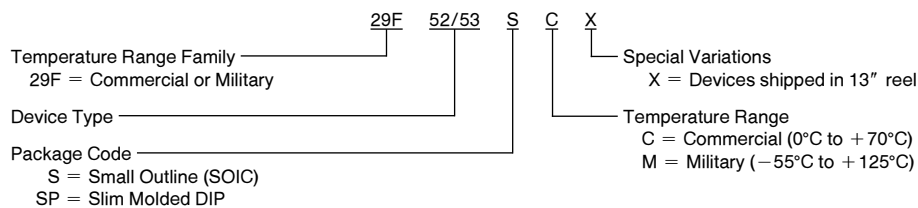
Symbol	Parameter	74F			54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V C <sub>L</sub> = 50 pF			T <sub>A</sub> , V <sub>CC</sub> = Mil C <sub>L</sub> = 50 pF		T <sub>A</sub> , V <sub>CC</sub> = Com C <sub>L</sub> = 50 pF		
		Min	Typ	Max	Min	Max	Min	Max	
t <sub>PLH</sub>	Propagation Delay	3.0	5.5	7.5			2.5	8.5	ns
t <sub>PHL</sub>	CPA or CPB to A <sub>n</sub> or B <sub>n</sub>	4.0	7.0	9.0			3.5	10.0	
t <sub>PZH</sub>	Output Enable Time	2.5	5.5	7.5			2.0	8.5	ns
t <sub>PZL</sub>	OE <sub>A</sub> or OE <sub>B</sub> to A <sub>n</sub> or B <sub>n</sub>	3.5	7.0	9.5			3.0	10.5	
t <sub>PHZ</sub>	Output Disable Time	2.5	6.5	9.0			2.0	10.0	ns
t <sub>PLZ</sub>	OE <sub>A</sub> or OE <sub>B</sub> to A <sub>n</sub> or B <sub>n</sub>	2.5	5.5	7.5			2.0	8.5	

## AC Operating Requirements

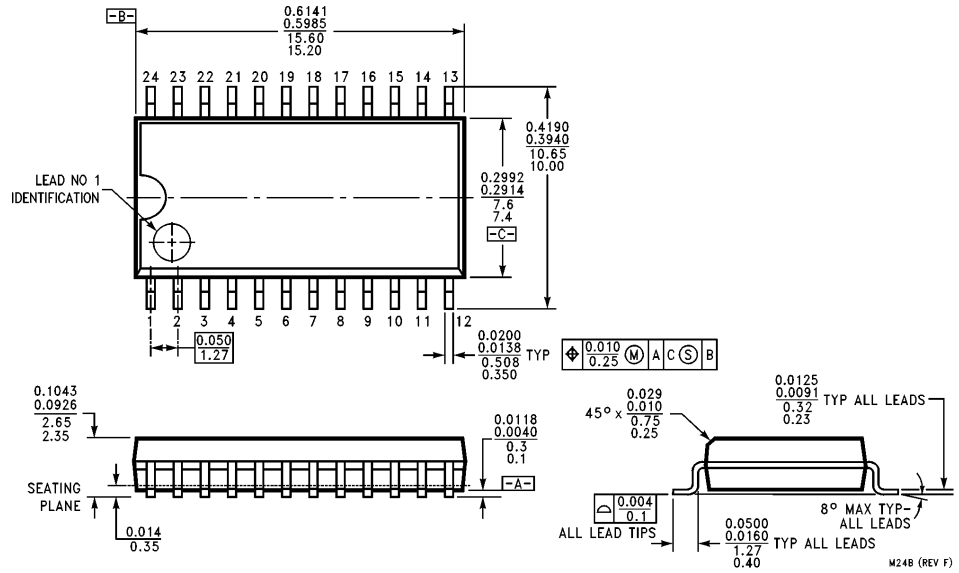
Symbol	Parameter	74F		54F		74F		Units
		T <sub>A</sub> = +25°C V <sub>CC</sub> = +5.0V		T <sub>A</sub> , V <sub>CC</sub> = Mil		T <sub>A</sub> , V <sub>CC</sub> = Com		
		Min	Max	Min	Max	Min	Max	
t <sub>s</sub> (H)	Setup Time, HIGH or LOW	4.0				4.5		ns
t <sub>s</sub> (L)	A <sub>n</sub> or B <sub>n</sub> to CPA or CPB	4.0				4.5		
t <sub>h</sub> (H)	Hold Time, HIGH or LOW	2.0				2.5		ns
t <sub>h</sub> (L)	A <sub>n</sub> or B <sub>n</sub> to CPA or CPB	2.0				2.5		
t <sub>s</sub> (H)	Setup Time, HIGH or LOW	1.0				1.5		ns
t <sub>s</sub> (L)	CE <sub>A</sub> or CE <sub>B</sub> to CPA or CPB	4.0				4.5		
t <sub>h</sub> (H)	Hold Time, HIGH or LOW	2.0				2.5		ns
t <sub>h</sub> (L)	CE <sub>A</sub> or CE <sub>B</sub> to CPA or CPB	2.0				2.5		
t <sub>w</sub> (H)	Pulse Width, HIGH or LOW	3.0				3.5		ns
t <sub>w</sub> (L)	CPA or CPB	3.0				3.5		

## 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:



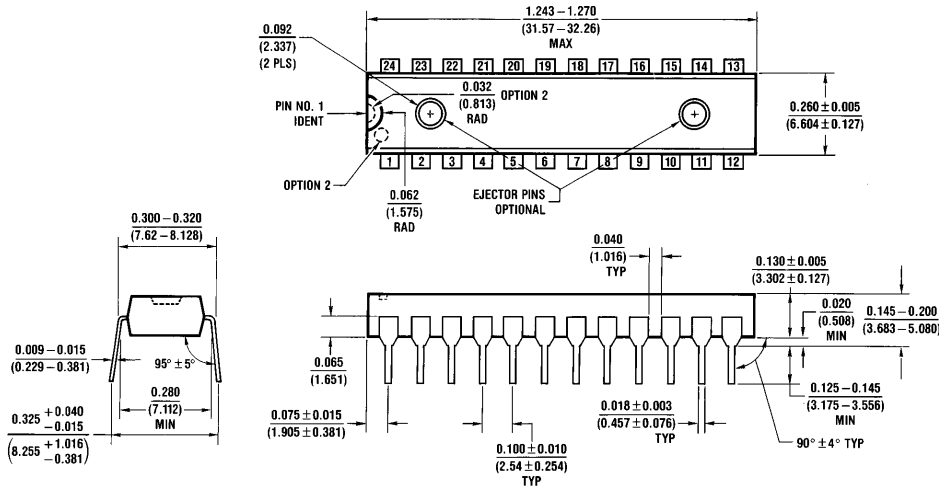
**Physical Dimensions** inches (millimeters)



**24-Lead (0.300" Wide) Molded Small Outline Package, JEDEC (S)  
NS Package Number M24B**

M24B (REV F)

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



**24-Lead (0.300" Wide) Molded Dual-In-Line Package (SP)  
NS Package Number N24C**

N24C (REV F)

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