

54F/74F410 Register Stack—16 x 4 RAM TRI-STATE® Output Register

General Description

The 'F410 is a register-oriented high-speed 64-bit Read/Write Memory organized as 16-words by 4-bits. An edge-triggered 4-bit output register allows new input data to be written while previous data is held. TRI-STATE outputs are provided for maximum versatility. The 'F410 is fully compatible with all TTL families.

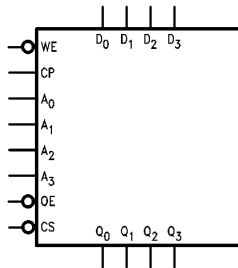
Features

- Edge-triggered output register
- Typical access time of 35 ns
- TRI-STATE outputs
- Optimized for register stack operation
- 18-pin package
- 9410 replacement

Commercial	Military	Package Number	Package Description
74F410PC		N18A	18-Lead (0.300" Wide) Molded Dual-In-Line
	54F410DM (Note 1)	J18A	18-Lead Ceramic Dual-In-Line
74F410SC		M20B	20-Lead (0.300" Wide) Molded Small Outline, JEDEC
54F410LM		W20A	20-Lead Cerpak

Note 1: Military grade device with environmental and burn-in processing. Use suffix = DMOB, LMOB

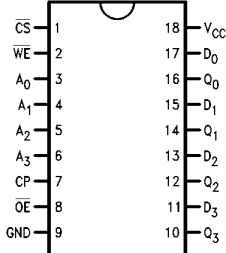
Logic Symbol



TL/F/9538-3

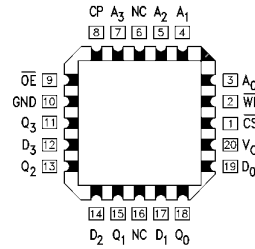
Connection Diagrams

Pin Assignment
for DIP and SOIC



TL/F/9538-1

Pin Assignment
for LCC



TL/F/9538-2

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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_0-A_3	Address Inputs	1.0/1.0	$20 \mu A / -0.6 \text{ mA}$
D_0-D_3	Data Inputs	1.0/1.0	$20 \mu A / -0.6 \text{ mA}$
\overline{CS}	Chip Select Input (Active LOW)	1.0/2.0	$20 \mu A / -1.2 \text{ mA}$
\overline{OE}	Output Enable Input (Active LOW)	1.0/1.0	$20 \mu A / -0.6 \text{ mA}$
\overline{WE}	Write Enable Input (Active LOW)	1.0/1.0	$20 \mu A / -0.6 \text{ mA}$
CP	Clock Input (Outputs Change on LOW-to-HIGH Transition)	1.0/2.0	$20 \mu A / -1.2 \text{ mA}$
Q_0-Q_3	TRI-STATE Outputs	150/40 (33.3)	$-3 \text{ mA} / 24 \text{ mA} (20 \text{ mA})$

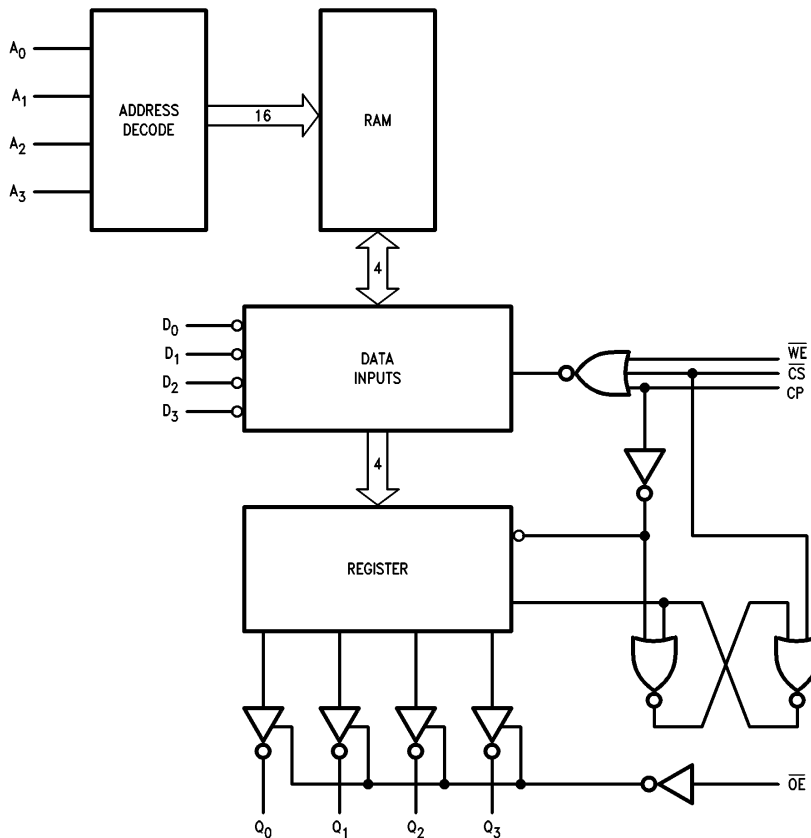
Functional Description

Write Operation—When the three control inputs, Write Enable (\overline{WE}), Chip Select (\overline{CS}), and Clock (CP), are LOW the information on the data inputs (D_0-D_3) is written into the memory location selected by the address inputs (A_0-A_3). If the input data changes while \overline{WE} , \overline{CS} , and CP are LOW, the contents of the selected memory location follow these changes, provided setup and hold time criteria are met.

Read Operation—Whenever \overline{CS} is LOW and CP goes from LOW-to-HIGH, the contents of the memory location selected by the address inputs (A_0-A_3) are edge-triggered into the Output Register.

The (\overline{OE}) input controls the output buffers. When \overline{OE} is HIGH the four outputs (Q_0-Q_3) are in a high impedance or OFF state; when \overline{OE} is LOW, the outputs are determined by the state of the Output Register.

Block Diagram



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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 _{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)

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	54F 10% V _{CC} 54F 10% V _{CC} 74F 10% V _{CC} 74F 10% V _{CC} 74F 5% V _{CC}	2.5 2.4 2.5 2.4 2.7		V	Min	I _{OH} = -1 mA I _{OH} = -3 mA I _{OH} = -1 mA I _{OH} = -3 mA I _{OH} = -3 mA
V _{OL}	Output LOW Voltage	54F 10% V _{CC} 74F 10% V _{CC}		0.5 0.5	V	Min	I _{OL} = 20 mA I _{OL} = 24 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 -1.2	mA	Max	V _{IN} = 0.5V (A _n , D _n , \overline{OE} , \overline{WE}) V _{IN} = 0.5V (\overline{CS} , CP)
I _{OZH}	Output Leakage Current			50	μA	Max	V _{OUT} = 2.7V
I _{OZL}	Output Leakage Current			-50	μA	Max	V _{OUT} = 0.5V
I _{OS}	Output Short-Circuit Current			-60	mA	Max	V _{OUT} = 0V
I _{ZZ}	Bus Drainage Test			500	μA	0.0V	V _{OUT} = 5.25V

DC Electrical Characteristics (Continued)

Symbol	Parameter	54F/74F			Units	V _{CC}	Conditions
		Min	Typ	Max			
I _{CCH}	Power Supply Current		47	70	mA	Max	V _O = HIGH
I _{CCL}	Power Supply Current		47	70	mA	Max	V _O = LOW
I _{CCZ}	Power Supply Current		47	70	mA	Max	V _O = HIGH Z

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	Max	Min	Max	Min	Max	
t _{PLH}	Propagation Delay	3.0	8.5	2.5	11.0	2.5	9.5	ns
t _{PHL}	CP to Q	3.5	9.0	3.0	12.0	3.0	10.0	
t _{PZH}	Enable Time	3.0	8.0	2.5	10.5	2.5	9.0	ns
t _{PZL}	\overline{OE} to Q	3.5	9.0	3.0	13.0	3.0	10.0	
t _{PHZ}	Disable Time	2.5	6.5	2.0	8.5	2.0	7.5	
t _{PLZ}	\overline{OE} to Q	2.5	7.0	2.0	9.5	2.0	8.0	

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	

READ MODE

t _s (H)	Setup Time, HIGH or LOW	15.0		23		17.0		ns
t _s (L)	A _n to CP	15.0		23		17.0		
t _h (H)	Hold Time, HIGH or LOW	0		0		0		ns
t _h (L)	A _n to CP	0		0		0		

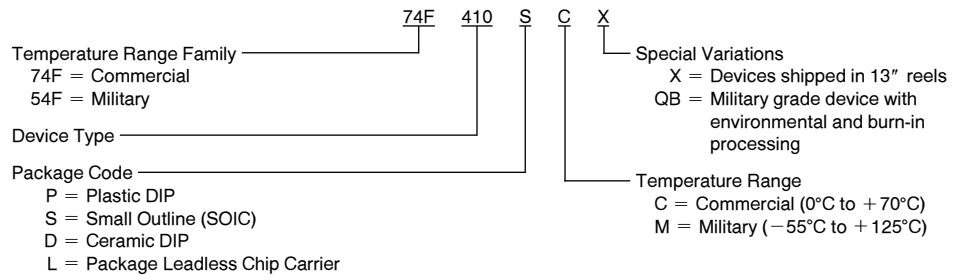
WRITE MODE

t _s (H)	Setup Time, HIGH or LOW	0		0		0		ns
t _s (L)	A _n to \overline{WE}	0		0		0		
t _h (H)	Hold Time, HIGH or LOW	0		0		0		ns
t _h (L)	A _n to \overline{WE}	0		0		0		
t _s (H)	Setup Time, HIGH or LOW	5.0		8.5		6.0		ns
t _s (L)	D _n to \overline{WE}	5.0		8.5		6.0		
t _h (H)	Hold Time, HIGH or LOW	0		2.5		0		ns
t _h (L)	D _n to \overline{WE}	0		2.5		0		
t _w	\overline{WE} Pulse Width Required to Write	7.5		9.5		8.5		ns
t _w	\overline{CS} Pulse Width Required to Write	7.5		9.5		8.5		ns
t _w	CP Pulse Width Required to Write	7.5		9.5		8.5		ns

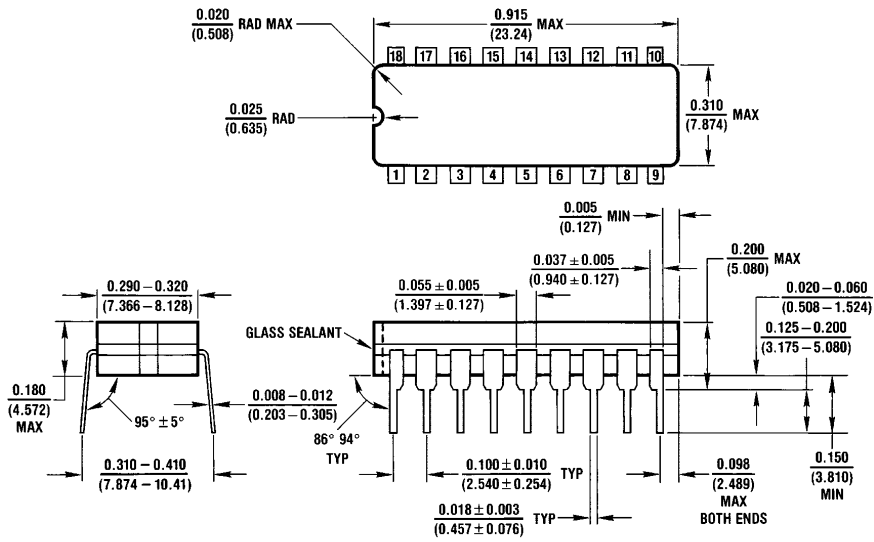
Note: Military temperature range for this device is -40°C to +85°C.

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:

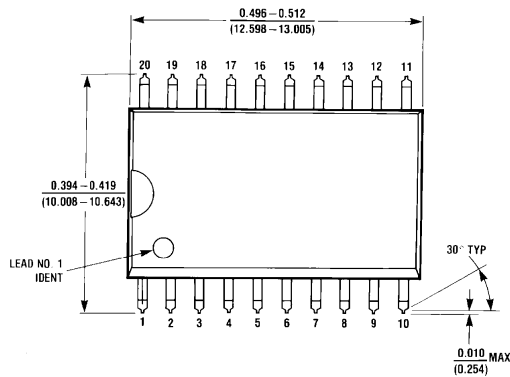


Physical Dimensions inches (millimeters)



J18A (REV L)

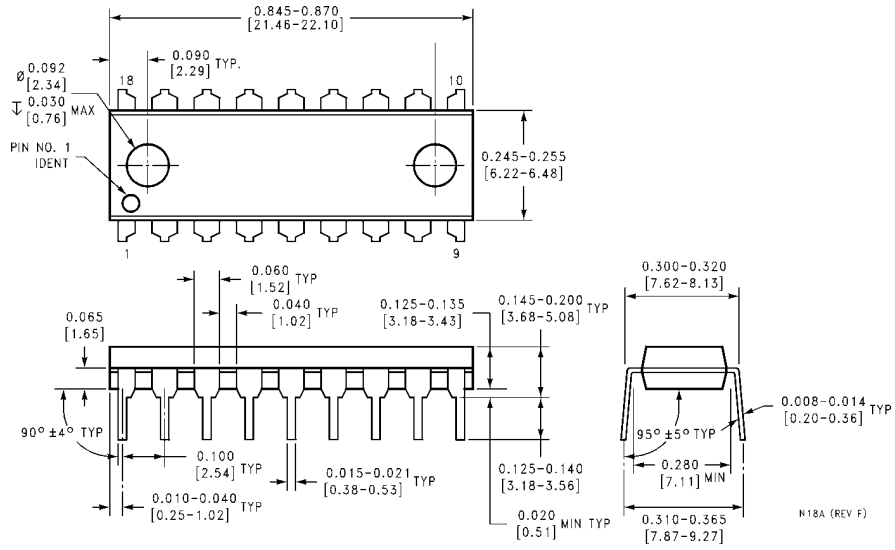
18-Lead Ceramic Dual-In-Line Package (D)
NS Package Number J18A



M20B (REV F)

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

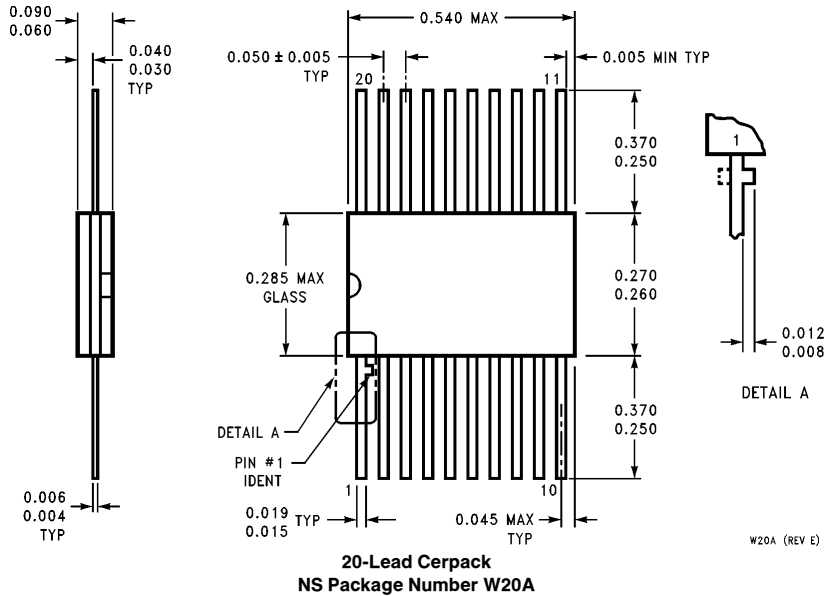
Physical Dimensions inches (millimeters) (Continued)



18-Lead (0.300" Wide) Molded Dual-In-Line Package (P)
NS Package Number N18A

N18A (REV F)

Physical Dimensions inches (millimeters) (Continued)



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