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Fairchild Semiconductor
74F821SPC

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April 1988
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74F821
10-Bit D-Type Flip-Flop

General Description

The 74F821 is a 10-bit D-type flip-flop with 3-STATE true outputs arranged in a broadside pinout.

Features

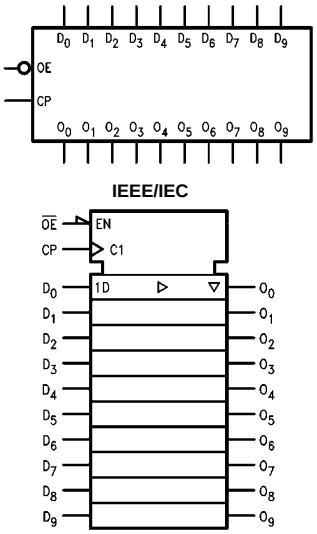
- 3-STATE Outputs

Ordering Code:

Order Number	Package Number	Package Description
74F821SC	M24B	24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
74F821SPC	N24C	24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

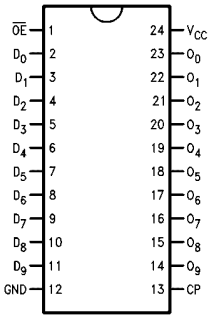
Devices also available in Tape and Reel. Specify by appending the suffix letter "X" to the ordering code.

Logic Symbols



IEEE/IEC

Connection Diagram



Unit Loading/Fan Out

Pin Names	Description	U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
D_0–D_9	Data Inputs	1.0/1.0	20 µA/–0.6 mA
$\overline{OE}$	Output Enable 3-STATE Input	1.0/1.0	20 µA/–0.6 mA
CP	Clock Input	1.0/1.0	20 µA/–0.6 mA
O_0–O_9	3-STATE Outputs	150/40 (33.3)	–3.0 mA/24 mA (20 mA)

Functional Description

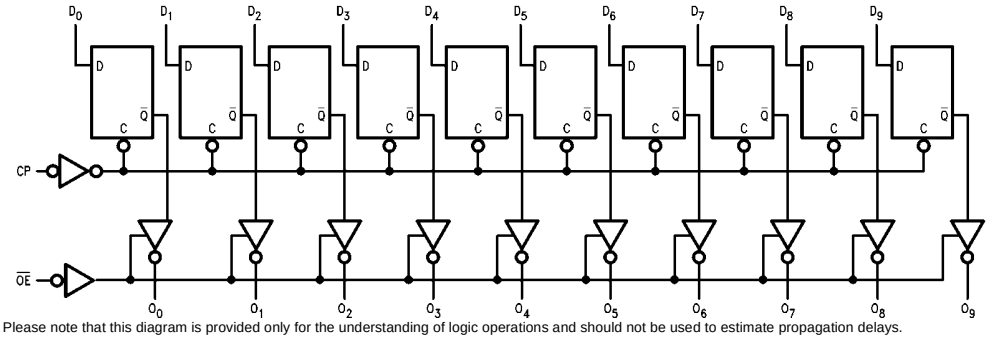
The 74F821 consists of ten D-type edge-triggered flip-flops. This device has 3-STATE true outputs for bus systems organized in a broadside pinning. The buffered Clock (CP) and buffered Output Enable ($\overline{OE}$) are common to all flip-flops. The flip-flops will store the state of their individual D inputs that meet the setup and hold times requirements on the LOW-to-HIGH CP transition. With the $\overline{OE}$ LOW the content of the flip-flops are available at the outputs. When the $\overline{OE}$ is HIGH, the outputs go to the high impedance state. Operation of the $\overline{OE}$ input does not affect the state of the flip-flops.

Function Table

Inputs			Internal	Output	Function
$\overline{OE}$	CP	D	$\overline{Q}$	O	
H	H	X	NC	Z	Hold
H	L	X	NC	Z	Hold
H	⌐	L	H	Z	Load
H	⌐	H	L	Z	Load
L	⌐	L	H	L	Data Available
L	⌐	H	L	H	Data Available
L	H	X	NC	NC	No Change in Data
L	L	X	NC	NC	No Change in Data

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

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.

Absolute Maximum Ratings (Note 1)

Storage Temperature	−65°C to +150°C
Ambient Temperature under Bias	−55°C to +125°C
Junction Temperature under Bias	−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}
3-STATE Output	−0.5V to +5.5V
Current Applied to Output	
in LOW State (Max)	twice the rated I_{OL} (mA)

Recommended Operating Conditions

Free Air Ambient Temperature	0°C to +70°C
Supply Voltage	+4.5V to +5.5V

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.

DC Electrical Characteristics

Symbol	Parameter		Min	Typ	Max	Units	V_{CC}	Conditions
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	10% V_{CC}	2.5			V	Min	I_{OH} = −1 mA
		10% V_{CC}	2.4					I_{OH} = −3 mA
		5% V_{CC}	2.7					I_{OH} = −1 mA
		5% V_{CC}	2.7					I_{OH} = −3 mA
V_{OL}	Output LOW Voltage	10% V_{CC}			0.5	V	Min	I_{OL} = 24 mA
I_{IH}	Input HIGH Current				5.0	µA	Max	V_{IN} = 2.7V
I_{BVI}	Input HIGH Current Breakdown Test				7.0	µA	Max	V_{IN} = 7.0V
I_{CEX}	Output HIGH Leakage Current				50	µA	Max	V_{OUT} = V_{CC}
V_{ID}	Input Leakage Test		4.75			V	0.0	I_{ID} = 1.9 µA, All Other Pins Grounded
I_{OD}	Output Leakage Circuit Current				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_{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		−150	mA	Max	V_{OUT} = 0V
I_{CCZ}	Power Supply Current			78	100	mA	Max	V_O = HIGH Z

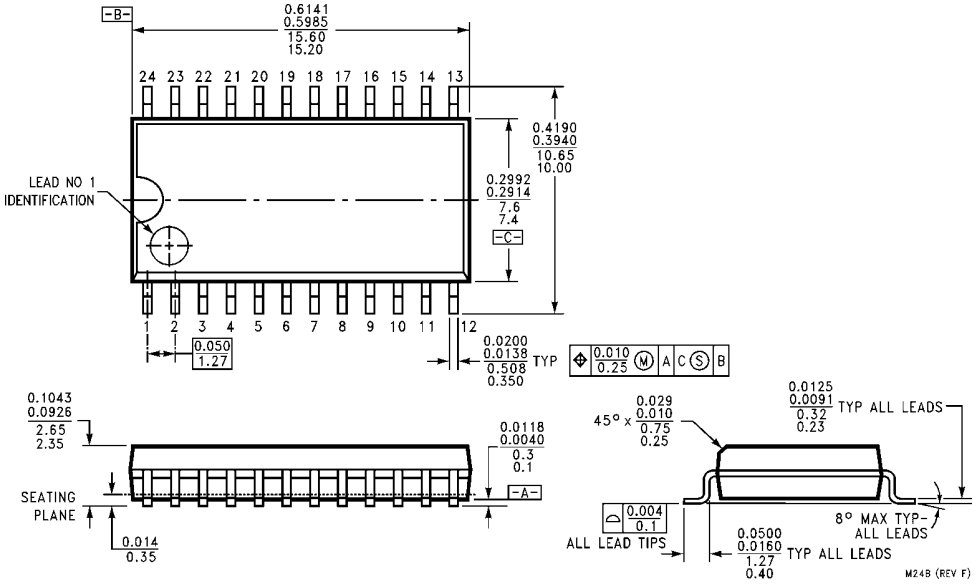
AC Electrical Characteristics

Symbol	Parameter	$T_A = +25°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF			$T_A = -55°C$ to $+125°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF		$T_A = 0°C$ to $+70°C$, $V_{CC} = +5.0V$, $C_L = 50$ pF		Units
		Min	Typ	Max	Min	Max	Min	Max	
f_{MAX}	Maximum Clock Frequency	100	150		60		70		MHz
t_{PLH}	Propagation Delay	2.0	6.4	9.5	2.0	10.5	2.0	10.5	ns
t_{PHL}	CP to O_n	2.0	6.2	9.5	2.0	10.5	2.0	10.5	
t_{PZH}	Output Enable Time	2.0	5.8	10.5	2.0	13.0	2.0	11.5	ns
t_{PZL}	$\overline{OE}$ to O_n	2.0	6.3	10.5	2.0	13.0	2.0	11.5	
t_{PHZ}	Output Disable Time	1.5	3.4	7.0	1.0	7.5	1.5	7.5	
t_{PLZ}	$\overline{OE}$ to O_n	1.5	3.5	7.0	1.0	7.5	1.5	7.5	

AC Operating Requirements

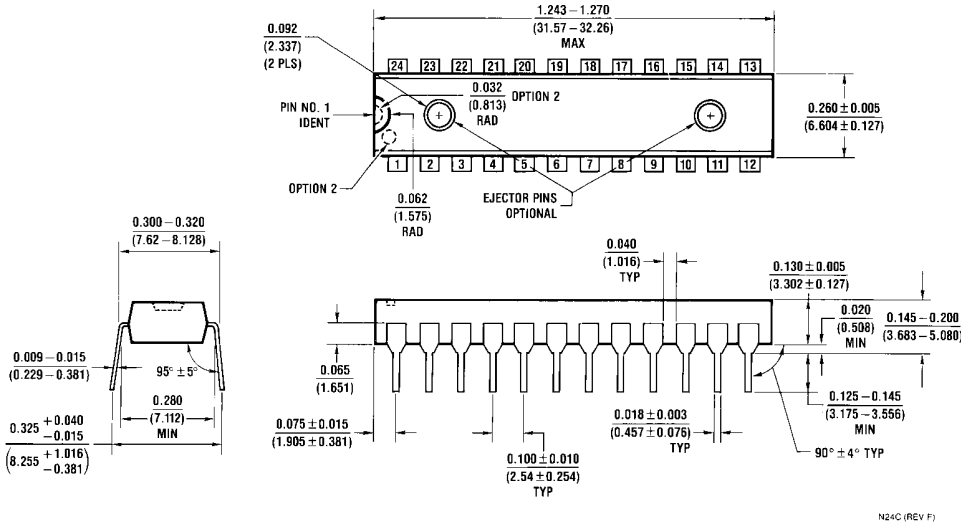
Symbol	Parameter	$T_A = +25°C$, $V_{CC} = +5.0V$		$T_A = -55°C$ to $+125°C$, $V_{CC} = +5.0V$		$T_A = 0°C$ to $+70°C$, $V_{CC} = +5.0V$		Units
		Min	Max	Min	Max	Min	Max	
$t_S(H)$	Setup Time, HIGH or LOW	2.5		4.0		3.0		ns
$t_S(L)$	D_n to CP	2.5		4.0		3.0		
$t_H(H)$	Hold Time, HIGH or LOW	2.5		2.5		2.5		
$t_H(L)$	D_n to CP	2.5		2.5		2.5		
$t_W(H)$	CP Pulse Width	5.0		6.0		6.0		ns
$t_W(L)$	HIGH or LOW	5.0		6.0		6.0		

Physical Dimensions inches (millimeters) unless otherwise noted



24-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
Package Number M24B

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)



24-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N24C