FAIRCHILD SEMICONDUCTOR™

April 1988
Revised August 1999

74F377
Octal D-Type Flip-Flop with Clock Enable

General Description

The 74F377 has eight edge-triggered, D-type flip-flops with individual D inputs and Q outputs. The common buffered Clock (CP) input loads all flip-flops simultaneously, when the Clock Enable ($\overline{CE}$) is LOW.

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. The $\overline{CE}$ input must be stable only one setup time prior to the LOW-to-HIGH clock transition for predictable operation.

Features

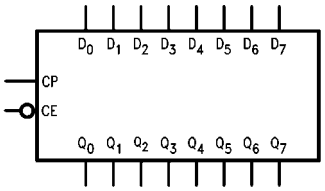
- Ideal for addressable register applications
- Clock enable for address and data synchronization applications
- Eight edge-triggered D-type flip-flops
- Buffered common clock
- See 74F273 for master reset version
- See 74F373 for transparent latch version
- See 74F374 for 3-STATE version

Ordering Code:

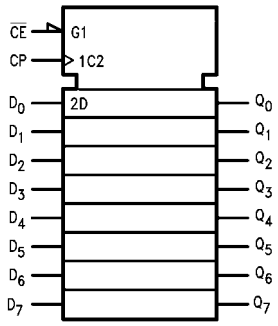
Order Number	Package Number	Package Description
74F377SC	M20B	20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
74F377SJ	M20D	20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
74F377PC	N20A	20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide

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

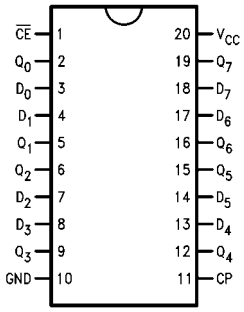
Logic Symbols



IEEE/IEC



Connection Diagram



© 1999 Fairchild Semiconductor Corporation

Unit Loading/Fan Out

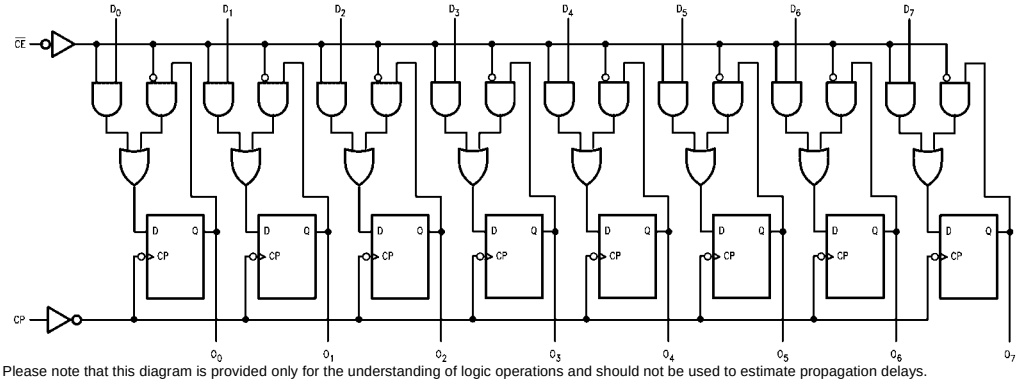
Pin Names	Description	U.L. HIGH/LOW	Input I_{IH}/I_{IL} Output I_{OH}/I_{OL}
D_0–D_7	Data Inputs	1.0/1.0	20 μA/–0.6 mA
$\overline{CE}$	Clock Enable (Active LOW)	1.0/1.0	20 μA/–0.6 mA
CP	Clock Pulse Input	1.0/1.0	20 μA/–0.6 mA
Q_0–Q_7	Data Outputs	50/33.3	–1 mA/20 mA

Mode Select-Function Table

Operating Mode	Inputs			Output
	CP	$\overline{CE}$	D_n	Q_n
Load “1”	⌐	l	h	H
Load “0”	⌐	l	l	L
Hold	⌐	h	X	No Change
(Do Nothing)	X	H	X	No Change

H = HIGH Voltage Level
h = HIGH Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition
L = LOW Voltage Level
l = LOW Voltage Level one setup time prior to the LOW-to-HIGH Clock Transition
X = Immaterial
⌐ = LOW-to-HIGH Clock Transition

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)
ESD Last Passing Voltage (Min)	4000V

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	10% V_{CC}	2.5			V	Min	I_{OH} = −1 mA
	Voltage	5% V_{CC}	2.7					I_{OH} = −1 mA
V_{OL}	Output LOW	10% V_{CC}			0.5	V	Min	I_{OL} = 20 mA
	Voltage							
I_{IH}	Input HIGH Current				5.0	µA	Max	V_{IN} = 2.7V
I_{BVI}	Input HIGH Current				7.0	µA	Max	V_{IN} = 7.0V
	Breakdown Test							
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_{CEX}	Output HIGH Leakage Current				50	µA	Max	V_{OUT} = V_{CC}
V_{ID}	Input Leakage		4.75			V	0.0	I_{ID} = 1.9 µA
	Test							All Other Pins Grounded
I_{OD}	Output Leakage				3.75	µA	0.0	V_{IOD} = 150 mV
	Circuit Current							All Other Pins Grounded
I_{CCH}	Power Supply Current			35	46	mA	Max	CP = ⌐
I_{CCL}				44	56			D_n = $\overline{MR}$ = HIGH

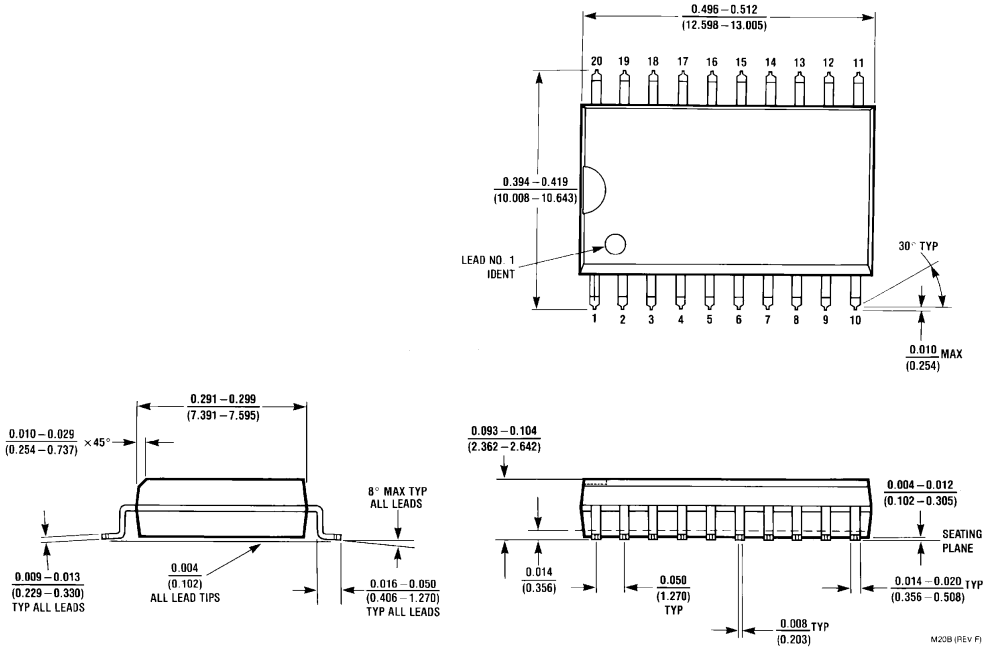
AC Electrical Characteristics

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	130			85		105		MHz
t_{PLH}	Propagation Delay	3.0		7.0	2.0	8.5	2.5	7.5	ns
t_{PHL}	CP to Q_n	4.0		9.0	3.0	10.5	3.5	9.0	

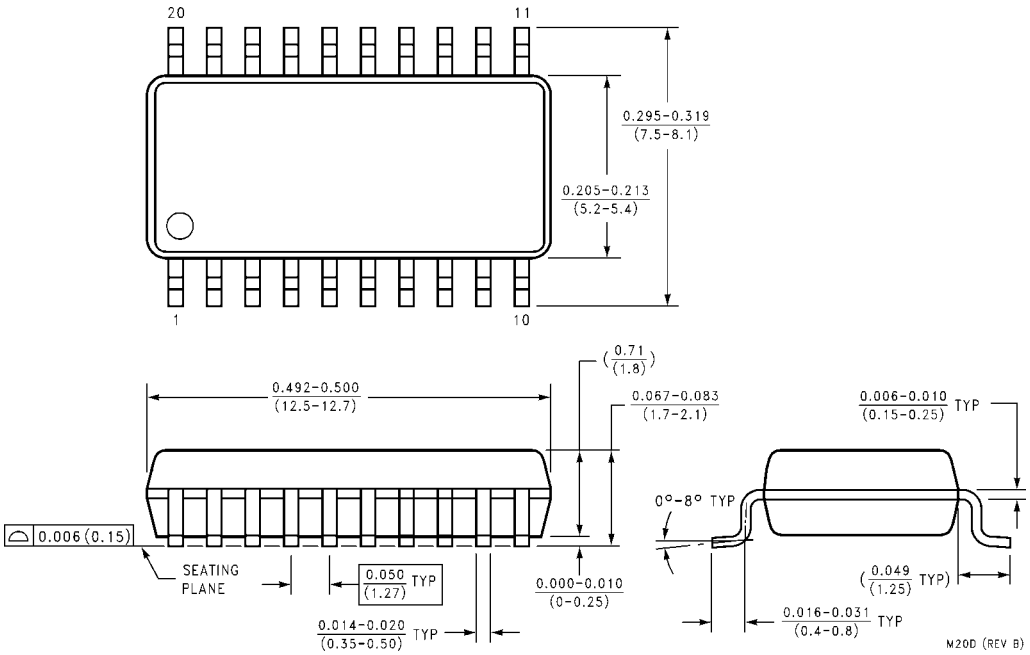
AC Operating Requirements

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	3.0		3.5		3.0		ns
$t_S(L)$	D_n to CP	3.5		4.0		3.5		
$t_H(H)$	Hold Time, HIGH or LOW	0.5		1.0		0.5		ns
$t_H(L)$	D_n to CP	1.0		1.0		1.0		
$t_S(H)$	Setup Time, HIGH or LOW	4.1		4.0		4.1		ns
$t_S(L)$	$\overline{CE}$ to CP	3.5		5.0		4.0		
$t_H(H)$	Hold Time, HIGH to LOW	0.5		1.5		0.5		ns
$t_H(L)$	$\overline{CE}$ to CP	2.0		2.5		2.0		
$t_W(H)$	Clock Pulse Width,	6.0		5.0		6.0		ns
$t_W(L)$	HIGH or LOW	6.0		5.0		6.0		

Physical Dimensions inches (millimeters) unless otherwise noted

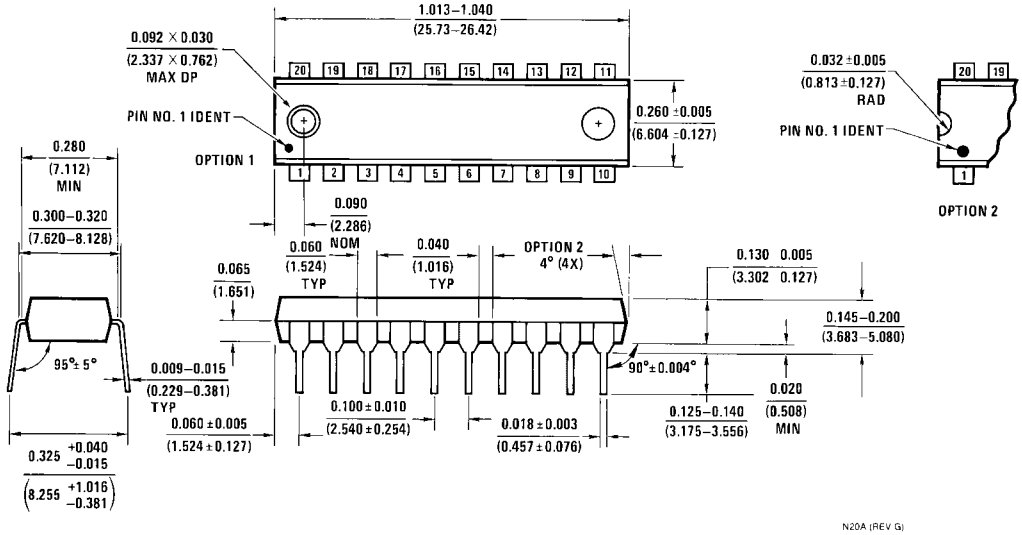


20-Lead Small Outline Integrated Circuit (SOIC), JEDEC MS-013, 0.300 Wide
Package Number M20B



20-Lead Small Outline Package (SOP), EIAJ TYPE II, 5.3mm Wide
Package Number M20D

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



20-Lead Plastic Dual-In-Line Package (PDIP), JEDEC MS-001, 0.300 Wide
Package Number N20A

Fairchild does not assume any responsibility for use of any circuitry described, no circuit patent licenses are implied and Fairchild reserves the right at any time without notice to change said circuitry and specifications.

LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in the labeling, can be reasonably expected to result in a significant injury to the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.

www.fairchildsemi.com