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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
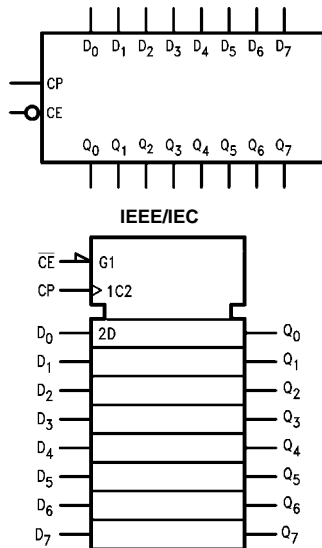

Connection Diagram

DS009525
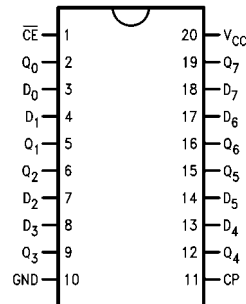
Unit Loading/Fan Out

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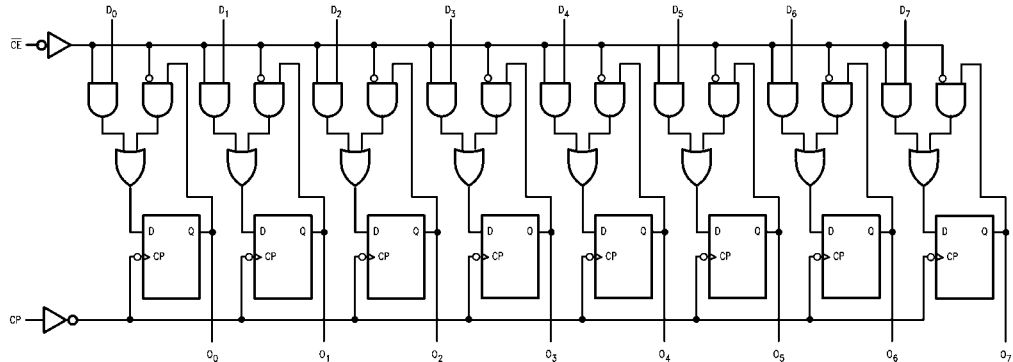
Please note that this diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays.

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.
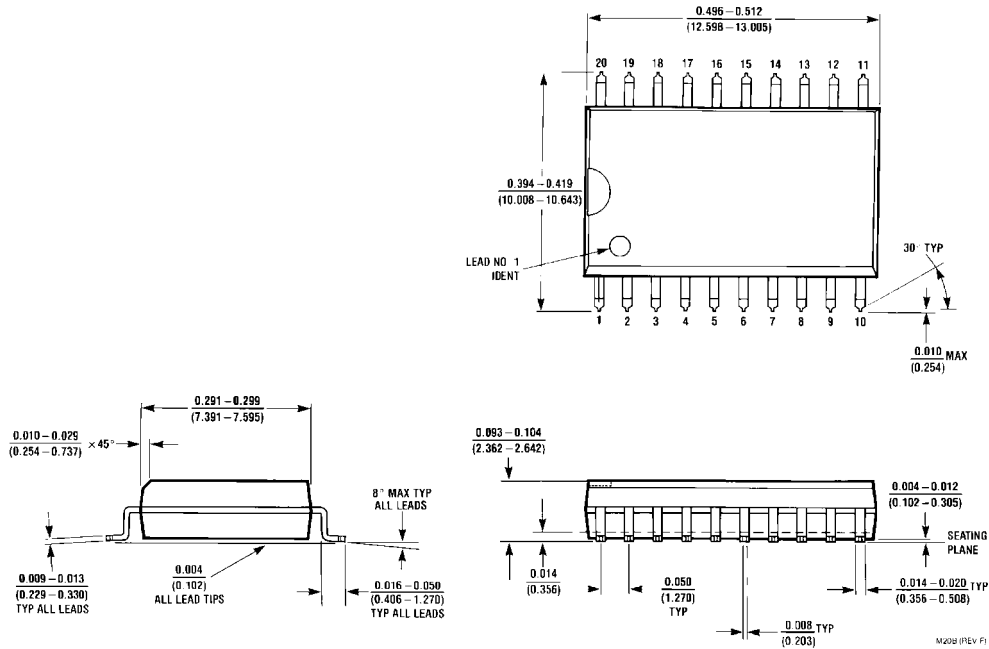
Note 2: Either voltage limit or current limit is sufficient to protect inputs.

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 Voltage	10% V_{CC}			0.5	V	Min	$I_{OL} = 20$ 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_{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 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_{CCH}	Power Supply Current			35	46	mA	Max	CP = ╱
I_{CCL}				44	56			$D_n = \overline{MR} = $ HIGH

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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

0.496 – 0.512
(12.598 – 13.005)

20 19 18 17 16 15 14 13 12 11

0.394 – 0.419
(10.008 – 10.643)

LEAD NO. 1
IDENT

1 2 3 4 5 6 7 8 9 10

30° TYP

0.010 MAX
(0.254)

0.291 – 0.299
(7.391 – 7.595)

0.010 – 0.029
(0.254 – 0.737) × 45°

8° MAX TYP
ALL LEADS

0.009 – 0.013
(0.229 – 0.330)
TYP ALL LEADS

0.004
(0.102)
ALL LEAD TIPS

0.016 – 0.050
(0.406 – 1.270)
TYP ALL LEADS

0.093 – 0.104
(2.362 – 2.642)

0.004 – 0.012
(0.102 – 0.305)

SEATING
PLANE

0.014
(0.356)

0.050
(1.270)
TYP

0.008 TYP
(0.203)

0.014 – 0.020 TYP
(0.356 – 0.508)

M20B (REV. F)

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

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

LAND PATTERN RECOMMENDATION

DIMENSIONS ARE IN MILLIMETERS

NOTES:
A. CONFORMS TO EIAJ EDR-7320 REGISTRATION, ESTABLISHED IN DECEMBER, 1998.
B. DIMENSIONS ARE IN MILLIMETERS.
C. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.

M20DRevB1

DETAIL A

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

Physical Dimensions inches (millimeters) unless otherwise noted (Continued)
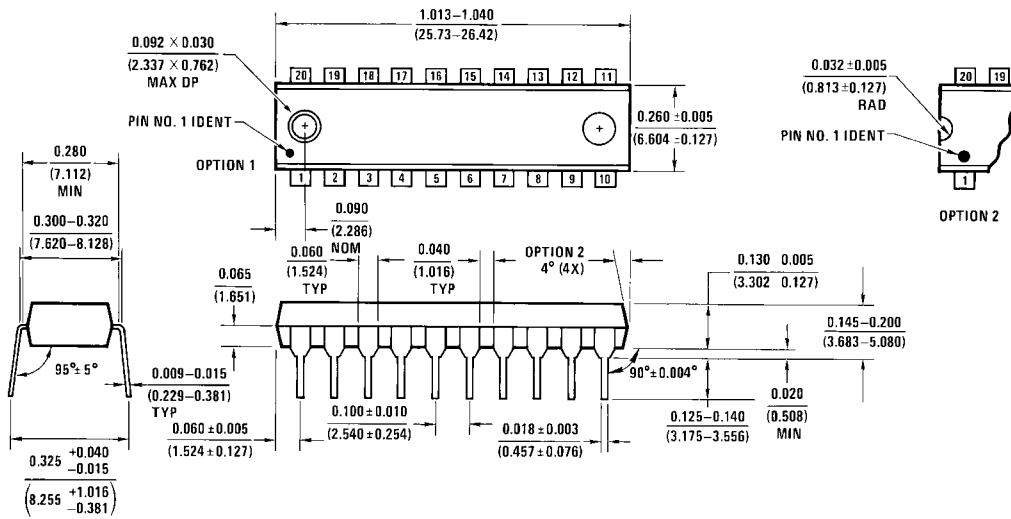
N20A (REV G)

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

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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.

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