

**CN74F161A-X REV 1B0**

 Original Creation Date: 12/16/96  
 Last Update Date: 06/19/97  
 Last Major Revision Date: 04/17/97

**SYNCHRONOUS PRESETTABLE BINARY COUNTER**
**General Description**

The F161A is a high-speed synchronous modulo-16 binary counter. It is synchronously presettable for application in programmable dividers and has two types of Count Enable inputs plus a Terminal Count output for versatility in forming synchronous multi-stage counters. The F161A has an asynchronous Master-Reset input that overrides all other inputs and forces the outputs LOW. The F161A is a high-speed version of the 'F161.

**Industry Part Number**

74F161A

**NS Part Numbers**

74F161ADC

**Prime Die**

M161A

**Processing**
**Quality Conformance Inspection**
**Subgrp Description Temp ( °C)**

1	Static tests at	+25
2	Static tests at	+70
3	Static tests at	0
4	Dynamic tests at	+25
5	Dynamic tests at	+70
6	Dynamic tests at	0
7	Functional tests at	+25
8A	Functional tests at	+70
8B	Functional tests at	0
9	Switching tests at	+25
10	Switching tests at	+70
11	Switching tests at	0

### **Features**

- Typical Count Frequency of 120 MHz
- Synchronous Counting and Loading
- High-speed Synchronous Expansion
- Guaranteed 4000V Minimum ESD Protection

**(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 +175 C
Vcc 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 +5.0mA
Voltage Applied to Output in HIGH State (with Vcc=0V)	
Standard Output	-0.5V to Vcc
TRI-STATE Output	-0.5V to +5.5V
Current Applied to Output in LOW State (Max)	twice the rated Iol(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 Commercial	0 C to +70 C
Supply Voltage Commercial	+4.5V to +5.5V

## Electrical Characteristics

### DC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
DC: VCC 4.5V to 5.5V, 0C to +70C

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
VIH	Input HIGH Voltage	Recognized as a HIGH Signal	1	INPUTS	2.0		V	1, 2, 3
VIL	Input LOW Voltage	Recognized as a LOW Signal	1	INPUTS		0.8	V	1, 2, 3
VCD	Input Clamp Diode Voltage	VCC=4.5V, IIN=-18mA	2, 3	INPUTS		-1.2	V	1, 2, 3
VOH	Output HIGH Voltage	VCC=4.5V, IOH=-1.0mA	2, 3	OUTPUTS	2.5		V	1, 2, 3
		VCC=4.75V, IOH=-1.0mA	2, 3	OUTPUTS	2.7		V	1, 2, 3
VOL	Output LOW Voltage	VCC=4.5V, IOL = 20mA	2, 3	OUTPUTS		0.5	V	1, 2, 3
IIH	Input HIGH Current	VCC=5.5V, VIN=2.7V	2, 3	INPUTS		5.0	uA	1, 2, 3
IBVI	Input HIGH Current Breakdown Test	VCC=5.5V, VIN=7.0V	2, 3	INPUTS		7.0	uA	1, 2, 3
ICEX	Output HIGH Leakage Current	VCC=5.5V, VOUT = VCC	2, 3	OUTPUTS		100	uA	1, 2, 3
VID	Input Leakage Test	VCC = 0.0V, IID = 1.9uA, All other pins grounded	2, 3	INPUTS	4.75		V	1, 2, 3
IOD	Output Leakage Circuit Current	VCC = 0.0V, VIOD = 150mV, All other pins grounded	2, 3	OUTPUTS		4.75	uA	1, 2, 3
IIL	Input LOW Current	VCC=5.5V, VIN=0.5V (CEP,CP, $\overline{MR}$ ,P0-P3)	2, 3	INPUTS		-0.6	mA	1, 2, 3
		VCC=5.5V, VIN=0.5V (CET, $\overline{PE}$ )	2, 3	INPUTS		-1.2	mA	1, 2, 3
IOS	Output Short-Circuit Current	VCC=5.5V, VOUT = 0V	2, 3	OUTPUTS	-60	-150	mA	1, 2, 3
ICC	Power Supply Current	VCC=5.5V	2, 3	VCC		55	mA	1, 2, 3

### AC PARAMETERS

(The following conditions apply to all the following parameters, unless otherwise specified.)  
AC: CL=50pF, RL=500 OHMS, TR=2.5ns, TF=2.5ns SEE AC FIGS. Temp Range: 0C to +70C

fMAX	Maximum Shift Frequency	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4		100		MHZ	9
			4		90		MHZ	10, 11
tpLH(1)	Propagation Delay ( $\overline{PE}$ input HIGH)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	CP to Qn	3.5	7.5	ns	9

## Electrical Characteristics

### AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)  
 AC: CL=50pF, RL=500 OHMS, TR=2.5ns, TF=2.5ns SEE AC FIGS. Temp Range: 0C to +70C

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH(1)	Propagation Delay (PE input HIGH)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	CP to Qn	3.5	8.5	ns	10, 11
tpHL(1)	Propagation Delay (PE input HIGH)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	CP to Qn	3.5	10.0	ns	9
tpHL(1)	Propagation Delay (PE input HIGH)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	CP to Qn	3.5	11.0	ns	10, 11
tpLH/HL(2)	Propagation Delay (PE input LOW)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	CP to Qn	4.0	8.5	ns	9
tpLH/HL(2)	Propagation Delay (PE input LOW)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	CP to Qn	4.0	9.5	ns	10, 11
tpLH/HL(3)	Propagation Delay	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	CP to TC	5.0	14.0	ns	9
			2, 3	CP to TC	5.0	15.0	ns	10, 11
tpLH/HL(4)	Propagation Delay	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	CET to TC	2.5	7.5	ns	9
			2, 3	CET to TC	2.5	8.5	ns	10, 11
tpHL(5)	Propagation Delay	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	MR to Qn	5.5	12.0	ns	9
			2, 3	MR to Qn	5.5	13.0	ns	10, 11
tpHL(6)	Propagation Delay	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	2, 3	MR to TC	4.5	10.5	ns	9
			2, 3	MR to TC	4.5	11.5	ns	10, 11
ts (H/L)1	Setup Time HIGH or LOW	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	Pn to CP	5.0		ns	9, 10, 11
th (H/L)1	Hold Time HIGH or LOW	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	Pn to CP	2.0		ns	9, 10, 11
ts (H) 2	Setup Time HIGH	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	PE to CP	11.0		ns	9
			4	PE to CP	11.5		ns	10, 11
ts (L) 2	Setup Time LOW	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	PE to CP	8.5		ns	9
			4	PE to CP	9.5		ns	10, 11
th (H) 2	Hold Time HIGH	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	PE to CP	2.0		ns	9, 10, 11

## Electrical Characteristics

### AC PARAMETERS (Continued)

(The following conditions apply to all the following parameters, unless otherwise specified.)  
AC: CL=50pf, RL=500 OHMS, TR=2.5ns, TF=2.5ns SEE AC FIGS. Temp Range: 0C to +70C

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
th (L) 2	Hold Time LOW	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	$\overline{PE}$ to CP	0.0		ns	9, 10, 11
ts (H) 3	Setup Time HIGH	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	CEP to CP	11.0		ns	9
			4	CEP to CP	11.5		ns	10, 11
ts (L) 3	Setup Time LOW	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	CEP to CP	5.0		ns	9, 10, 11
th (H) 3	Hold Time HIGH	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	CEP to CP	0.0		ns	9, 10, 11
th (L) 3	Hold Time LOW	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	CEP to CP	0.0		ns	9, 10, 11
tw (H)	Pulse Width HIGH (Load)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	CP	5.0		ns	9, 10, 11
tw (L)	Pulse Width LOW (Load)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	CP	5.0		ns	9, 10, 11
tw (H)	Pulse Width HIGH (count)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	CP	4.0		ns	9, 10, 11
tw (L)	Pulse Width LOW (count)	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	CP	6.0		ns	9
			4	CP	7.0		ns	10, 11
tw (L)	Pulse Width LOW	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	$\overline{MR}$	5.0		ns	9, 10, 11
tREC	Recovery Time	VCC=+5.0V @ +25C, VCC=4.5V & 5.5V @ 0/+70C	4	$\overline{MR}$ to CP	6.0		ns	9, 10, 11

Note 1: Guaranteed by applying specific input condition and testing VOL & VOH.

Note 2: Screen tested 100% on each device at +75 C temperature only, subgroups A2 & A10.

Note 3: Sample tested (Method 5005, Table 1) on each MFG. lot at +75C temperature only, subgroups A2 & A10.

Note 4: Guaranteed but not tested.

**Revision History**

Rev	ECN #	Rel Date	Originator	Changes
1B0	M0001329	06/19/97	Donald B. Miller	