

MN54F169-X REV 1A0

 Original Creation Date: 05/17/96
 Last Update Date: 07/30/96
 Last Major Revision Date: 05/17/96

4-STAGE SYNCHRONOUS BIDIRECTIONAL COUNTERS

General Description

The F169 is a fully synchronous 4-stage up/down counter. The F169 is a modulo- 16 binary counter. It features a preset capability for programmable operation, carry lookahead for easy cascading and a U/D input to control the direction of counting. All state changes, whether in counting or parallel loading, are initiated by the LOW-to-HIGH transition of the clock.

Industry Part Number

54F169

Prime Die

M169

NS Part Numbers

 54F169DM
 54F169DMQB
 54F169FMQB
 54F169LMQB

Processing

MIL-STD-883, Method 5004

Quality Conformance Inspection

MIL-STD-883, Method 5005

Subgrp	Description	Temp (°C)
1	Static tests at	+25
2	Static tests at	+125
3	Static tests at	-55
4	Dynamic tests at	+25
5	Dynamic tests at	+125
6	Dynamic tests at	-55
7	Functional tests at	+25
8A	Functional tests at	+125
8B	Functional tests at	-55
9	Switching tests at	+25
10	Switching tests at	+125
11	Switching tests at	-55

Features

- Asynchronous Counting and Loading
- Built-In Lookahead Carry Capability
- Presettable for Programmable Operation

(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 those 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
Military	-55 C to +125 C
Supply Voltage	
Military	+4.5V to +5.5V
Commercial	+4.5V to +5.5V

Electrical Characteristics

DC PARAMETER

(The following conditions apply to all the following parameters, unless otherwise specified.)

DC: VCC 4.5V to 5.5V, Temp range: -55C to 125C

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
IIH	Input High Current	VCC=5.5V, VM=2.7V, VINH=5.5V, VINL=0.0V	1, 3	INPUTS		20	uA	1, 2, 3
IBVI	Input High Current	VCC=5.5V, VM=7.0V, VINH=5.5V, VINL=0.0V	1, 3	INPUTS		100	uA	1, 2, 3
IIL	Input LOW Current CP, CEP, Pn, PE, U/D	VCC=5.5V, VM=0.5V, VINH=5.5V, VINL=0.0V	1, 3	INPUTS		-0.6	mA	1, 2, 3
IIL2	Input LOW Current	VCC=5.5V, VM=0.5V, VINH=5.5V, VINL=0.0V	1, 3	INPUTS CET		-1.2	mA	1, 2, 3
VOL	Output LOW Voltage	VCC=4.5V, VIL=0.8V, VIH=2.0V, IOL=20mA, VINL=0.0V, VINH=5.5V	1, 3	OUTPUTS		0.5	V	1, 2, 3
VOH	Output HIGH Voltage	VCC=4.5V, VIL=0.8V, IOH=-1.0mA, VIH=2.0V, VINL=0.0V, VINH=5.5V	1, 3	OUTPUTS	2.5		V	1, 2, 3
IOS	Short Circuit Current	VCC=5.5V, VINH=5.5V, VINL=0.0V, VM=0.0V	1, 3	OUTPUTS	-60	-150	mA	1, 2, 3
VCD	Input Clamp Diode Voltage	VCC=4.5V, IM=-18mA, VINH=5.5V	1, 3	INPUTS		-1.2	V	1, 2, 3
ICC	Supply Current	VCC=5.5V, VINL=0.0V, VINH=5.5V	1, 3	VCC		52	mA	1, 2, 3
ICEX	Output HIGH Leakage Current	VCC=5.5V, VINL=0.0V, VINH=5.5V, VM=5.5V	1, 3	OUTPUTS		250	uA	1, 2, 3

AC PARAMETER

(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

tpLH(1)	Propagation Delay	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	2, 5	CP to Qn	3.0	8.5	ns	9
			2, 5	CP to Qn	3.0	12.0	ns	10, 11
tpHL(1)	Propagation Delay	VCC= 5.0V @25C, VCC=4.5V & 5.5V @-55/125C	2, 5	CP to Qn	4.0	11.5	ns	9
			2, 5	CP to Qn	4.0	16.0	ns	10, 11
tpLH(2)	Propagation Delay	VCC= 5.0V @25C, VCC=4.5V & 5.5V @-55/125C	2, 5	CP to TC	5.5	15.0	ns	9
			2, 5	CP to TC	5.5	20.0	ns	10, 11
tpHL(2)	Propagation Delay	VCC= 5.0V @25C, VCC=4.5V & 5.5V @-55/125C	2, 5	CP to TC	4.0	12.0	ns	9
			2, 5	CP to TC	4.0	15.0	ns	10, 11

Electrical Characteristics

AC PARAMETER(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

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
tpLH(3)	Propagation Delay	VCC= 5.0V @25C, VCC=4.5V & 5.5V @-55/125C	2, 5	CET to TC	2.0	6.0	ns	9
			2, 5	CET to TC	2.5	9.0	ns	10, 11
tpHL(3)	Propagation Delay	VCC= 5.0V @25C, VCC=4.5V & 5.5V @-55/125C	2, 5	CET to TC	2.5	11.0	ns	9
			2, 5	CET to TC	2.5	12.0	ns	10, 11
tpLH(4)	Propagation Delay	VCC= 5.0V @25C, VCC=4.5V & 5.5V @-55/125C	2, 5	U/D to TC	3.5	11.5	ns	9
			2, 5	U/D to TC	3.5	16.0	ns	10, 11
tpHL(4)	Propagation Delay	VCC= 5.0V @25C, VCC=4.5V & 5.5V @-55/125C	2, 5	U/D to TC	4.0	12.0	ns	9
			2, 5	U/D to TC	4.0	14.0	ns	10, 11
ts(H/L)(1)	Setup Time	VCC= 5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	Pn to CP	4.0		ns	9
			6	Pn to CP	4.5		ns	10, 11
th(H/L)(1)	Hold Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	Pn to CP	3.0		ns	9
			6	Pn to CP	3.5		ns	10, 11
ts(H/L)(2)	Setup Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	PE to CP	8.0		ns	9
			6	PE to CP	10.0		ns	10, 11
th(H)(2)	Hold Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	PE to CP	1.0		ns	9, 10, 11
th(L)(2)	Hold Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	PE to CP	0.0		ns	9, 10, 11
ts(H)(3)	Setup Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	CEP/CET to CP	7.0		ns	9
			6	CEP/CET to CP	8.0		ns	10, 11
ts(L)(3)	Setup Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	CEP/CET to CP	6.0		ns	9
			6	CEP/CET to CP	8.0		ns	10, 11

Electrical Characteristics

AC PARAMETER(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

SYMBOL	PARAMETER	CONDITIONS	NOTES	PIN-NAME	MIN	MAX	UNIT	SUB-GROUPS
th(H)(3)	Hold Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	CEP/CET to CP	0.0		ns	9, 10, 11
th(L)(3)	Hold Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	CEP/CET to CP	0.0		ns	9
			6	CEP/CET to CP	1.0		ns	10, 11
ts(H)(4)	Setup Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	U/D to CP	11.0		ns	9
			6	U/D to CP	14.0		ns	10, 11
ts(L)(4)	Setup Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	U/D to CP	9.0		ns	9
			6	U/D to CP	12.0		ns	10, 11
th(H/L)(4)	Hold Time	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C	6	U/D to CP	0.0		ns	9, 10, 11
tw(H)	Pulse Width	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C TR/TF=1.0ns	6	CP	4.0		ns	9
			6	CP	6.0		ns	10, 11
tw(L)	Pulse Width	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C TR/TF=1.0ns	6	CP	7.0		ns	9
			6	CP	9.0		ns	10, 11
fMAX	Maximum Count Frequency	VCC=5.0V @25C, VCC=4.5V & 5.5V @-55/125C TR/TF=1.0ns	6		90		MHZ	9
			6		60		MHZ	10, 11

Note 1: Screen tested 100% on each device at +25C, +125C & -55C temperature, subgroups A1, 2, 3, 7 & 8.

Note 2: Screen tested 100% on each device at +25C temperature only, subgroup A9.

Note 3: Sample tested (Method 5005, Table 1) on each MFG. lot at +25C, +125C & -55C temperature, subgroups A1, 2, 3, 7 & 8.

Note 4: Sample tested (Method 5005, Table 1) on each MFG. lot at +25C subgroup A9, and periodically at +125C & -55C temperature, subgroups 10 & 11.

Note 5: Sample tested (Method 5005, Table 1) on each MFG. lot, subgroups A9, 10 & 11.

Note 6: GUARANTEED BUT NOT TESTED. (Design Characterization Data)