INTEGRATED CIRCUITS

DATA SHEET

74F393Dual 4-bit binary ripple counter

Product specification

1988 Nov 01

IC15 Data Handbook





Dual 4-bit binary ripple counter

74F393

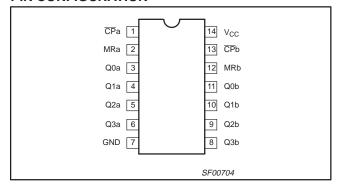
FEATURES

- Two 4-bit binary counters
- Two Master Resets to clear each 4-bit counter individually

DESCRIPTION

The 74F393 is a Dual Ripple Counter with separate Clock (\overline{CP}_n) and Master Reset (MR) inputs to each counter. The two counters are identified by the "a" and "b" suffixes in the pin configuration. The operation of each half of the 74F393 is the same. The counters are triggered by a High-to-Low transition of the Clock (\overline{CP}_a and \overline{CP}_b) inputs. The counter outputs are internally connected to provide Clock inputs to succeeding stages. The outputs of the ripple counter do not change synchronously and should not be used for high speed address decoding. The Master Resets (MRa and MRb) are active High asynchronous inputs; one for each 4-bit counter. A High level in the MR input overrides the Clock and sets the outputs Low.

PIN CONFIGURATION



TYPE	TYPICAL f _{MAX}	TYPICAL SUPPLY CURRENT (TOTAL)
74F393	125MHz	40mA

ORDERING INFORMATION

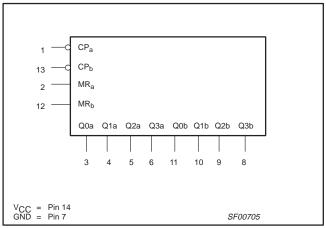
DESCRIPTION	COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0$ °C to +70°C	PKG DWG #		
14-pin plastic DIP	N74F393N	SOT27-1		
14-pin plastic SO	N74F393D	SOT108-1		

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

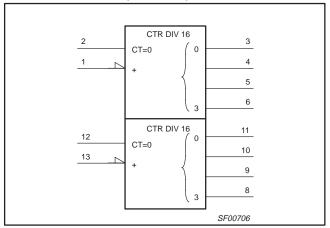
PINS	DESCRIPTION	74F (U.L.) HIGH/LOW	LOAD VALUE HIGH/LOW		
CP _a , CP _b	Clock inputs	1.0/1.0	20μA/0.6mA		
MR _a , MR _b	Master Reset inputs	1.0/1.0	20μA/0.6mA		
Q _{na} – Q _{nb}	Data outputs	50/33.3	1.0mA/20mA		

NOTE: One (1.0) FAST unit load is defined as: 20μA in the High state and 0.6mA in the Low state.

LOGIC SYMBOL



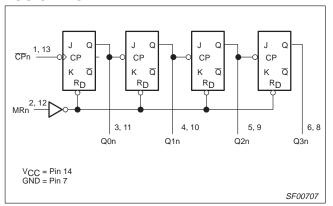
IEC/IEEE SYMBOL (IEEE/IEC)



Dual 4-bit binary ripple counter

74F393

LOGIC DIAGRAM



FUNCTION TABLE

COUNT		OUTI	PUTS	
COUNT	Q _{0n}	Q _{1n}	Q _{2n}	Q _{3n}
0	L	L	L	L
1	Н	L	L	L
2	L	Н	L	L
3	Н	Н	L	L
4	L	L	Н	L
5	Н	L	Н	L
6	L	Н	Н	L
7	Н	Н	Н	L
8	L	L	L	Н
9	Н	L	L	Н
10	L	Н	L	Н
11	Н	Н	L	Н
12	L	L	Н	Н
13	Н	L	Н	Н
14	L	Н	Н	Н
15	Н	Н	Н	Н

H = High voltage level transition

L = Low voltage level

ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limits set forth in this table may impair the useful life of the device. Unless otherwise noted these limits are over the operating free-air temperature range.)

SYMBOL	PARAMETER	RATING	UNIT
V _{CC}	Supply voltage	-0.5 to +7.0	V
V _{IN}	Input voltage	-0.5 to +7.0	V
I _{IN}	Input current	-30 to +5	mA
V _{OUT}	Voltage applied to output in High output state	−0.5 to V _{CC}	V
I _{OUT}	Current applied to output in Low output state	40	mA
T _{amb}	Operating free-air temperature range	0 to +70	°C
T _{stg}	Storage temperature range	-65 to +150	°C

RECOMMENDED OPERATING CONDITIONS

SYMBOL	PARAMETER			UNIT	
STWIBUL	PARAMETER	MIN	NOM	MAX	UNII
V _{CC}	Supply voltage	4.5	5.0	5.5	V
V _{IH}	High-level input voltage	2.0			V
V _{IL}	Low-level input voltage			0.8	V
I _{IK}	Input clamp current			-18	mA
I _{OH}	High-level output current			-1	mA
I _{OL}	Low-level output current			20	mA
T _{amb}	Operating free-air temperature range	0		70	°C

Dual 4-bit binary ripple counter

74F393

DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

SYMBOL	PARAMETER		TEST CONDITION	one1	LIMITS			UNIT		
STWIBUL	PARAMETER	TAKAMETEK			MIN	TYP ²	MAX			
V	Himb lavel autout valtage		$V_{CC} = MIN, V_{IL} = MAX$	±10%V _{CC}	2.5			\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		
V _{OH}	High-level output voltage	V _{IH} = MIN, I _{OH} = MAX	±5%V _{CC}	2.7	3.4		V			
V	Lave lavel autout valtage		$V_{CC} = MIN, V_{IL} = MAX$	±10%V _{CC}		0.30	0.50	V		
V _{OL}	Low-level output voltage		$V_{IH} = MIN, I_{OL} = MAX$	±5%V _{CC}		0.30	0.50	V		
V _{IK}	Input clamp voltage	$V_{CC} = MIN, I_I = I_{IK}$			-0.73	-1.2	V			
I _I	Input current at maximum input v	oltage	$V_{CC} = MAX, V_I = 7.0V$				100	μΑ		
I _{IH}	High-level input current		$V_{CC} = MAX, V_I = 2.7V$				20	μΑ		
I _{IL}	Low-level input current		$V_{CC} = MAX, V_I = 0.5V$				-0.6	mA		
I _{OS}	Short-circuit output current ³		V _{CC} = MAX		-60		-150	mA		
	Іссн		V 1444			25	36	mA		
Icc	Supply current (total)	I _{CCL}	V _{CC} = MAX			42	58	mA		

NOTES:

1. For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.

AC ELECTRICAL CHARACTERISTICS

					LIM	ITS			
SYMBOL	PARAMETER	TEST CONDITION	T _a C _L = 5	/ _{CC} = +5\ _{mb} = +25 0pF, R _L =	V °C = 500Ω	V _{CC} = +5 T _{amb} = 0°0 C _L = 50pF,	UNIT		
			MIN	TYP	MAX	MIN	MAX		
f _{MAX}	Maximum clock frequency	Waveform 1	100	130		100		MHz	
t _{PLH} t _{PHL}	Propagation delay CPn to Q0a or Q0b	Waveform 1	3.5 5.0	5.5 7.0	8.0 10.0	3.5 5.0	9.0 10.5	ns	
t _{PLH} t _{PHL}	Propagation delay CPn to Q1a, Q1b	Waveform 1	5.0 7.5	7.0 9.5	10.0 12.0	4.5 7.0	13.0 13.0	ns	
t _{PLH} t _{PHL}	Propagation delay CPn to Q2a, Q2b	Waveform 1	8.0 9.5	10.0 11.5	13.0 14.5	7.0 9.0	15.0 15.5	ns	
t _{PLH} t _{PHL}	Propagation delay CPn to Q3a, Q3b	Waveform 1	10.5 12.0	12.5 14.0	15.5 16.5	10.0 11.5	17.0 17.5	ns	
t _{PHL}	Propagation delay MR to Qna, Qnb	Waveform 2	4.0	6.0	9.0	4.0	9.0	ns	

1988 Nov 01

All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
 Not more than one output should be shorted at a time. For testing I_{OS}, the use of high-speed test apparatus and/or sample-and-hold techniques are preferable in order to minimize internal heating and more accurately reflect operational values. Otherwise, prolonged shorting of a High output may raise the chip temperature well above normal and thereby cause invalid readings in other parameter tests. In any sequence of parameter tests, I_{OS} tests should be performed last.

Dual 4-bit binary ripple counter

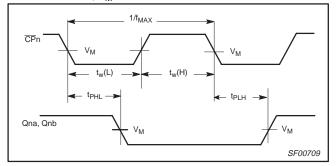
74F393

AC SETUP REQUIREMENTS

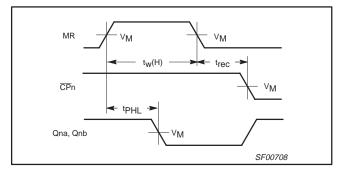
SYMBOL	PARAMETER	TEST CONDITION	$V_{CC} = +5V$ $T_{amb} = +25^{\circ}C$ $C_{L} = 50pF, R_{L} = 500\Omega$			V _{CC} = +5 T _{amb} = 0°C C _L = 50pF,	UNIT	
			MIN	TYP	MAX	MIN	MAX	
t _W (H) t _W (L)	CPn Pulse width High or Low	Waveform 1	4.5 3.5			5.0 4.0		ns
t _W (H)	MR Pulse width High	Waveform 2	3.5			4.5		ns
t _{REC}	Recovery time MR to CPn	Waveform 2	2.5			3.0		ns

AC WAVEFORMS

For all waveforms, $V_M = 1.5V$.

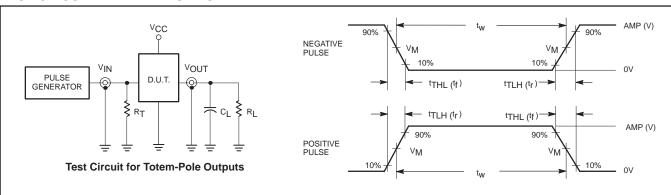


Waveform 1. Propagation Delay, Clock Input to Output, Clock Pulse Width, and Maximum Clock Frequency



Waveform 2. Master Reset Pulse Width, Master Reset to Output Delay, and Master Reset to Clock Recovery Time

TEST CIRCUIT AND WAVEFORMS



DEFINITIONS:

R_L = Load resistor;

see AC ELECTRICAL CHARACTERISTICS for value. Load capacitance includes jig and probe capacitance;

C_L = Load capacitance includes jig and probe capacitance; see AC ELECTRICAL CHARACTERISTICS for value.

 $R_T = Termination resistance should be equal to <math>Z_{OUT}$ of pulse generators.

Input Pulse Definition

family	INP	INPUT PULSE REQUIREMENTS								
family	amplitude	V_{M}	rep. rate	t _w	t _{TLH}	t _{THL}				
74F	3.0V	1.5V	1MHz	500ns	2.5ns	2.5ns				

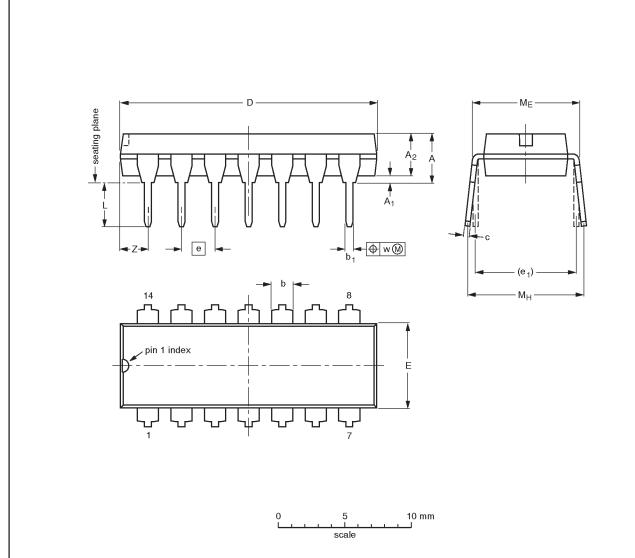
SF00006

Dual 4-bit binary ripple counter

74F393

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A ₁ min.	A ₂ max.	b	b ₁	С	D ⁽¹⁾	E ⁽¹⁾	е	e ₁	L	ME	M _H	w	Z ⁽¹⁾ max.
mm	4.2	0.51	3.2	1.73 1.13	0.53 0.38	0.36 0.23	19.50 18.55	6.48 6.20	2.54	7.62	3.60 3.05	8.25 7.80	10.0 8.3	0.254	2.2
inches	0.17	0.020	0.13	0.068 0.044	0.021 0.015	0.014 0.009	0.77 0.73	0.26 0.24	0.10	0.30	0.14 0.12	0.32 0.31	0.39 0.33	0.01	0.087

Note

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

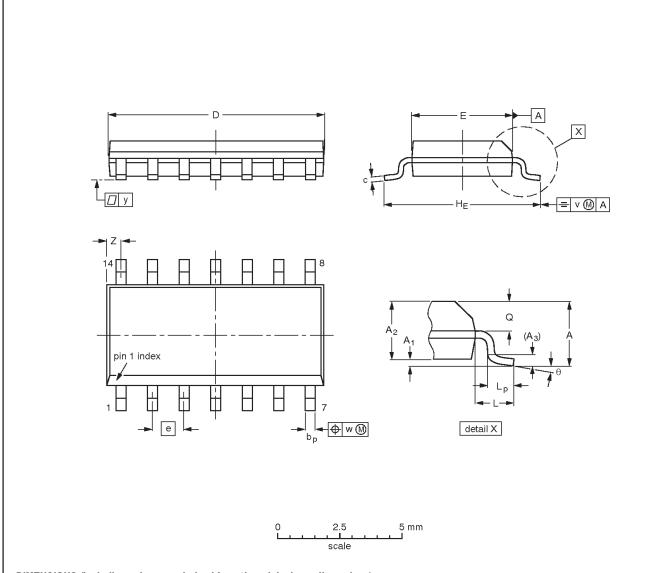
	OUTLINE		REFER	EUROPEAN	ISSUE DATE			
	VERSION	IEC	JEDEC	EIAJ		PROJECTION	ISSUE DATE	
	SOT27-1	050G04	MO-001AA				92-11-17 95-03-11	

Dual 4-bit binary ripple counter

74F393

SO14: plastic small outline package; 14 leads; body width 3.9 mm

SOT108-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

UNIT	A max.	A ₁	A ₂	А3	bp	С	D ⁽¹⁾	E ⁽¹⁾	е	HE	L	Lp	Q	v	w	у	Z ⁽¹⁾	θ
mm	1.75	0.25 0.10	1.45 1.25	0.25	0.49 0.36	0.25 0.19	8.75 8.55	4.0 3.8	1.27	6.2 5.8	1.05	1.0 0.4	0.7 0.6	0.25	0.25	0.1	0.7 0.3	8°
inches	0.069	0.010 0.004	0.057 0.049	0.01		0.0100 0.0075	0.35 0.34	0.16 0.15	0.050	0.244 0.228	0.041	0.039 0.016		0.01	0.01	0.004	0.028 0.012	0°

Note

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

OUTLINE		REFER	EUROPEAN	ISSUE DATE		
VERSION	IEC	JEDEC	EIAJ		PROJECTION	ISSUE DATE
SOT108-1	076E06S	MS-012AB				-95-01-23- 97-05-22

Dual 4-bit binary ripple counter

74F393

Data sheet status

Data sheet status	Product status	Definition [1]
Objective specification	Development	This data sheet contains the design target or goal specifications for product development. Specification may change in any manner without notice.
Preliminary specification	Qualification	This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make chages at any time without notice in order to improve design and supply the best possible product.
Product specification	Production	This data sheet contains final specifications. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product.

^[1] Please consult the most recently issued datasheet before initiating or completing a design.

Definitions

Short-form specification — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

Limiting values definition — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

Application information — Applications that are described herein for any of these products are for illustrative purposes only. Philips Semiconductors make no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Disclaimers

Life support — These products are not designed for use in life support appliances, devices or systems where malfunction of these products can reasonably be expected to result in personal injury. Philips Semiconductors customers using or selling these products for use in such applications do so at their own risk and agree to fully indemnify Philips Semiconductors for any damages resulting from such application.

Right to make changes — Philips Semiconductors reserves the right to make changes, without notice, in the products, including circuits, standard cells, and/or software, described or contained herein in order to improve design and/or performance. Philips Semiconductors assumes no responsibility or liability for the use of any of these products, conveys no license or title under any patent, copyright, or mask work right to these products, and makes no representations or warranties that these products are free from patent, copyright, or mask work right infringement, unless otherwise specified.

Philips Semiconductors 811 East Arques Avenue P.O. Box 3409 Sunnyvale, California 94088–3409 Telephone 800-234-7381 © Copyright Philips Electronics North America Corporation 1998 All rights reserved. Printed in U.S.A.

print code Date of release: 10-98

Document order number: 9397-750-05125

Let's make things better.

Philips Semiconductors



