Advance Information

Clock Driver Quad D-Type Flip-Flop

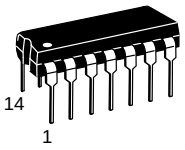
With Matched Propagation Delays

MC74F1803

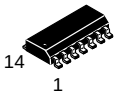
CLOCK DRIVER QUAD D-TYPE FLIP-FLOP WITH MATCHED PROPAGATION DELAYS

The MC74F1803 is a high-speed, low-power, quad D-type flip-flop featuring separate D-type inputs and inverting outputs with closely matched propagation delays. With a buffered clock (CP) input that is common to all flip-flops, the MC74F1803 is useful in high-frequency systems as a clock driver, providing multiple outputs that are synchronous. Because of the matched propagation delays, the duty cycles of the output waveforms in a clock driver application are symmetrical within 2.0 nanoseconds.

- Edge-Triggered D-Type Inputs
- Buffered Positive Edge-Triggered Clock
- Matched Outputs for Synchronous Clock Driver Applications
- Outputs Guaranteed for Simultaneous Switching

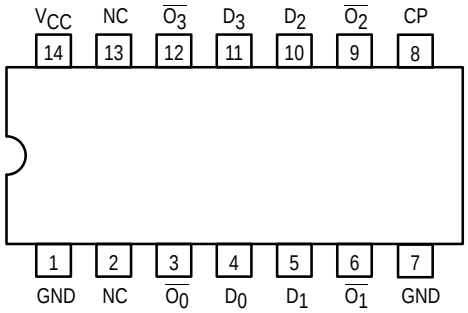


N SUFFIX
PLASTIC
CASE 646-06

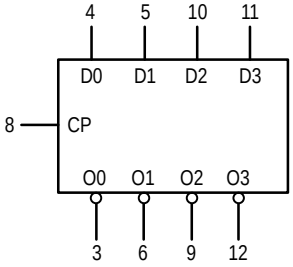


D SUFFIX
SOIC
CASE 751A-03

Pinout: 14-Lead Plastic (Top View)

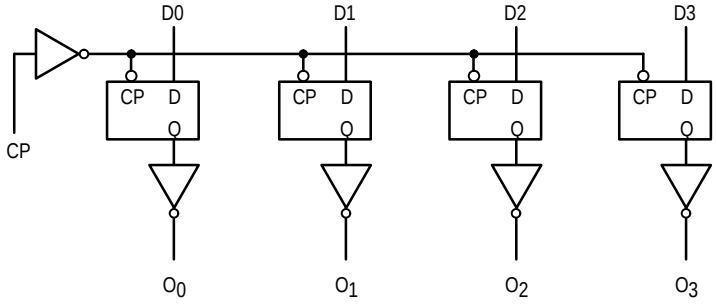


LOGIC SYMBOL



V_{CC} = PIN 14
GND = PINS 1 AND 7
NC = PINS 2 AND 13

LOGIC DIAGRAM



V_{CC} = Pin 14; GND = Pins 1,7; NC = Pins 2, 13

NOTE: This diagram is provided only for the understanding of logic operations and should not be used to estimate propagation delays

This document contains information on a new product. Specifications and information herein are subject to change without notice.

MOTOROLA

FUNCTIONAL DESCRIPTION

The MC74F1803 consists of four positive edge-triggered flip-flops with individual D-type inputs and inverting outputs. The buffered clock is common to all flip-flops and the following specifications allow for outputs switching simultaneously. The four flip-flops store the state of their individual D inputs that meet the setup and hold time requirements on the LOW-to-HIGH Clock (CP) transition. The maximum frequency of the clock input is 70 megahertz and the LOW-to-HIGH and HIGH-to-LOW propagation delays of the $\overline{On}$ output vary by at most, 2.0 nanoseconds. Therefore, the device is ideal for use as a divide-by-two driver for high-frequency clock signals that require symmetrical duty cycles. In addition, the output-to-output skew is a maximum of 2.0 nanoseconds. Finally, the I_{OH} specification at 2.5 volts is guaranteed to be at least –20 milli-amps. If their inputs are identical, multiple outputs can be tied together and the I_{OH} is commensurately increased.

GUARANTEED OPERATION RANGES

Symbol	Parameter	Min	Typ	Max	Unit
V_{CC}	Supply Voltage	4.5	5.0	5.5	V
T_A	Operating Ambient Temperature Range	0	25	70	°C
I_{OH}	Output Current — High	—	—	–20	mA
I_{OL}	Output Current — Low	—	—	24	mA

DC CHARACTERISTICS OVER OPERATING TEMPERATURE RANGE (Unless otherwise specified)

Symbol	Parameter		Limits Min	Limits Typ	Limits Max	Unit	Test Conditions [1,2]	
V_{IH}	Input HIGH Voltage		2.0	–	–	V	Guaranteed Input HIGH Voltage	
V_{IL}	Input LOW Voltage		–	–	0.8	V	Guaranteed Input LOW Voltage	
V_{IK}	Input Clamp Diode Voltage		–	–	–1.2	V	V_{CC} = MIN, I_{IN} = –18 mA	
V_{OH}	Output HIGH Voltage A_n Outputs	74	2.5	–	–	V	I_{OH} = –20 mA	V_{CC} =4.5 V
V_{OL}	Output LOW Voltage A_n Outputs	74	–	0.35	0.5	V	I_{OL} = 24 mA	V_{CC} = MIN
I_{IH}	Input HIGH Current		–	–	20	µA	V_{CC} = MAX, V_{IN} = 2.7 V	
			–	–	100	µA	V_{CC} = MAX, V_{IN} = 7.0 V	
I_{IL}	Input LOW Current		–	–	–0.6	mA	V_{CC} = MAX, V_{IN} = 0.5 V	
I_{OS}	Output Short Circuit Current [3]		–60	–	–150	mA	V_{CC} = MAX, V_{OUT} = 0 V	
I_{CC}	Power Supply Current		–	–	70	mA	V_{CC} = MAX	

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

2 Normal test conditions for this device are all four outputs switching simultaneously. Two outputs of the MC74F1803 can be tied together and the I_{OH} doubles.

3 Not more than one output should be shorted at a time, nor for more than 1 second.

AC OPERATING REQUIREMENTS (T_A = 0°C to +70°C: V_{CC} = +5.0 V ±10%: RL = 500 Ω)

Symbol	Parameter	C_L = 50 pF Min	C_L = 50 pF Max	Unit
$t_s(H)$ $t_s(L)$	Setup Time, HIGH or LOW: D_n to CP	3.0 3.0	– –	ns
t_f	$t_p + t_s$ [1]	–	9.0	ns
$t_h(H)$ $t_h(L)$	Hold Time, HIGH or LOW: D_n to CP	2.0 2.0	– –	ns
$t_w(H)$ $t_w(L)$	Cp Pulse Width HIGH or LOW	7.0 6.0	– –	ns

1 The combination of the setup time (t_S) requirement and maximum propagation delay (t_D) are guaranteed to be within this limit for all conditions.

AC ELECTRICAL CHARACTERISTICS (T_A = 0°C to +70°C: V_{CC} = +5.0 V ±10%: RL = 500 Ω) [1]

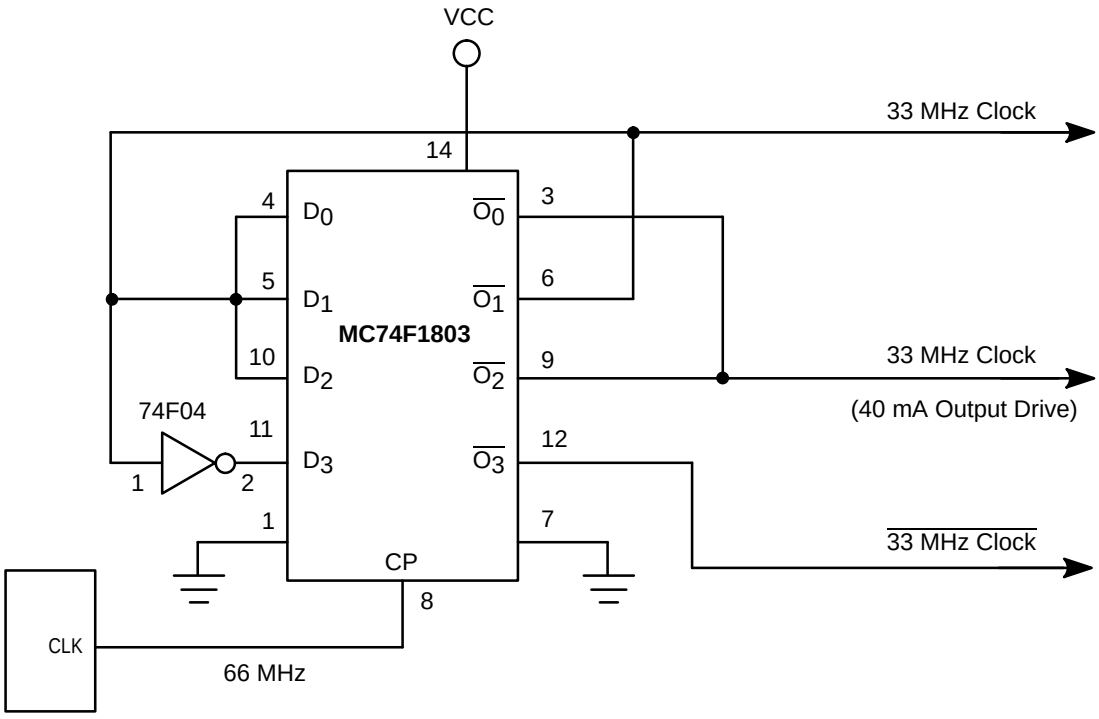
Symbol	Parameter	C_L = 50 pF		Unit
		Min	Max	
f_{max}	Maximum Clock Frequency	70	–	MHz
t_{PLH} t_{PHL}	Propagation Delay CP to $\overline{O_n}$	3.0	7.5	ns
t_{Pv}	Propagation Delay CP to $\overline{O_n}$ Variation	–	3.0	ns
t_{ps} $\overline{O_0}$, $\overline{O_1}$, $\overline{O_2}$, $\overline{O_3}$,	Propagation Delay Skew $\lvert t_{PLH}$ Actual – t_{PHL} Actual$\rvert$ for $\overline{O_0}$, $\overline{O_1}$, $\overline{O_2}$, $\overline{O_3}$	–	2.0	ns
t_{os}	Output to Output Skew [2] $\lvert t_p \overline{O_n} - t_p \overline{O_m} \rvert$	–	2.0	ns
t_{rise}, t_{fall} $\overline{O_1}$,	Rise/Fall Time for $\overline{O_1}$ (0.8 to 2.0 V)	–	3.0	ns
t_{rise}, t_{fall} $\overline{O_0}$, $\overline{O_2}$, $\overline{O_3}$,	Rise/Fall Time for $\overline{O_1}$, $\overline{O_2}$, $\overline{O_3}$, (0.8 to 2.0 V)	–	3.5	ns

1 The test conditions used are all four outputs switching simultaneously. The AC characteristics described above are also guaranteed when two outputs are tied together.

2 Where $t_p \overline{O_n}$ and $t_p \overline{O_m}$ are the actual propagation delays (any combination of high or low) for two separate outputs from a given high transition of CP.

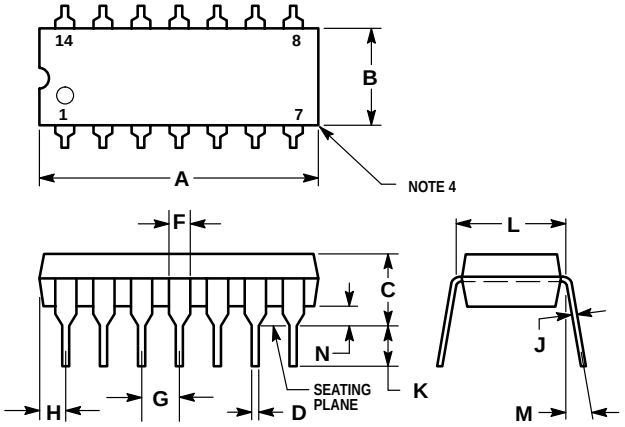
3 For a given set of conditions (i.e., capacitive load, temperature, V_{CC}, and number of outputs switching simultaneously) the variation from device to device is guaranteed to be less than or equal to the maximum.

TYPICAL MC74F1803 APPLICATION



OUTLINE DIMENSIONS

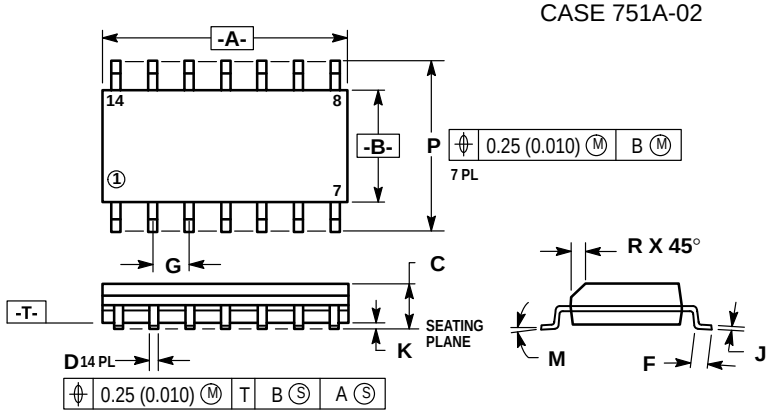
N SUFFIX
PLASTIC PACKAGE
CASE 646-06



NOTES:
1. LEADS WITHIN 0.13 mm (0.005) RADIUS OF TRUE POSITION AT SEATING PLANE AT MAXIMUM MATERIAL CONDITION.
2. DIMENSION "L" TO CENTER OF LEADS WHEN FORMED PARALLEL.
3. DIMENSION "B" DOES NOT INCLUDE MOLD FLASH.
4. ROUNDED CORNERS OPTIONAL.
5. 646-05 OBSOLETE, NEW STANDARD 646-06.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	18.16	19.56	0.715	0.770
B	6.10	6.60	0.240	0.260
C	3.69	4.69	0.145	0.185
D	0.38	0.53	0.015	0.021
F	1.02	1.78	0.040	0.070
G	2.54 BSC		0.100 BSC	
H	1.32	2.41	0.052	0.095
J	0.20	0.38	0.008	0.015
K	2.92	3.43	0.115	0.135
L	7.62 BSC		0.300 BSC	
M	0°	10°	0°	10°
N	0.39	1.01	0.015	0.039

D SUFFIX
SOIC PACKAGE
CASE 751A-02



NOTES:
1. DIMENSIONS "A" AND "B" ARE DATUMS AND "T" IS A DATUM SURFACE.
2. DIMENSIONING AND TOLERANCING PER ANSI Y14.5M, 1982.
3. CONTROLLING DIMENSION: MILLIMETER.
4. DIMENSION A AND B DO NOT INCLUDE MOLD PROTRUSION.
5. MAXIMUM MOLD PROTRUSION 0.15 (0.006) PER SIDE.
6. 751A-01 IS OBSOLETE, NEW STANDARD 751A-02.

	MILLIMETERS		INCHES	
DIM	MIN	MAX	MIN	MAX
A	8.55	8.75	0.337	0.344
B	3.80	4.00	0.150	0.157
C	1.35	1.75	0.054	0.068
D	0.35	0.49	0.014	0.019
F	0.40	1.25	0.016	0.049
G	1.27 BSC		0.050 BSC	
J	0.19	0.25	0.008	0.009
K	0.10	0.25	0.004	0.009
M	0°	7°	0°	7°
P	5.80	6.20	0.229	0.244
R	0.25	0.50	0.010	0.019

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