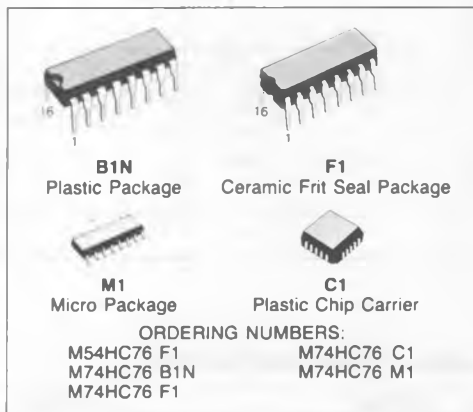


## DUAL J-K FLIP FLOP WITH PRESET AND CLEAR

- HIGH SPEED  
 $f_{MAX} = 60 \text{ MHz (TYP.) at } V_{CC} = 5V$
- LOW POWER DISSIPATION  
 $I_{CC} = 2 \mu\text{A (MAX.) at } 25^\circ\text{C}$
- OUTPUT DRIVE CAPABILITY  
 10 LSTTL LOADS
- BALANCED PROPAGATION DELAYS  
 $t_{PLH} = t_{PHL}$
- HIGH NOISE IMMUNITY  
 $V_{NIH} = V_{NIL} = 28\% V_{CC} \text{ (MIN.)}$
- WIDE OPERATING VOLTAGE RANGE  
 $V_{CC} \text{ (OPR.)} = 2V \text{ to } 6V$
- PIN AND FUNCTION COMPATIBLE  
 WITH 54/74LS76



### DESCRIPTION

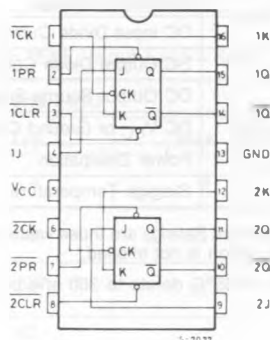
The M54/74HC76 is a high speed CMOS DUAL J-K FLIP FLOP fabricated in silicon gate C<sup>2</sup>MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption. Depending on with the logic level at the J and K inputs this device changes state on the negative going transition of the clock pulse. CLEAR and PRESET are independent of the clock and are accomplished by a logic low on the corresponding input. All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### TRUTH TABLE

INPUTS					OUTPUTS		FUNCTION
CLR	PR	J	K	CK	Q	$\bar{Q}$	
L	H	X	X	X	L	H	CLEAR
H	L	X	X	X	H	L	PRESET
L	L	X	X	X	H	H	
H	H	L	L	$\downarrow$	$Q_n$	$\bar{Q}_n$	NO CHANGE
H	H	L	H	$\downarrow$	L	H	
H	H	H	L	$\downarrow$	H	L	
H	H	H	H	$\downarrow$	$\bar{Q}_n$	$Q_n$	TOGGLE
H	H	X	X	$\uparrow$	$Q_n$	$\bar{Q}_n$	NO CHANGE

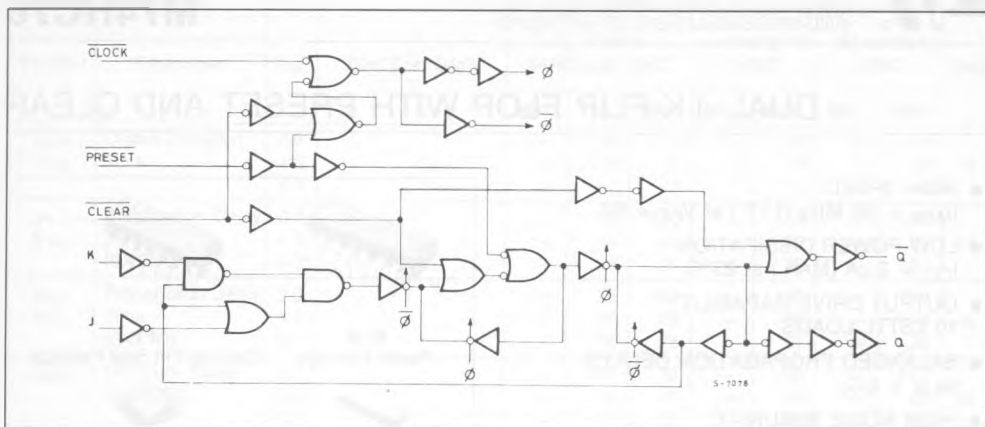
X: DON'T CARE

### PIN CONNECTIONS (top view)



FOR CHIP CARRIER  
 INFORMATION CONTACT SGS-THOMSON

## LOGIC DIAGRAM (1/2 Package)



## ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	- 0.5 to 7	V
$V_I$	DC Input Voltage	- 0.5 to $V_{CC} + 0.5$	V
$V_O$	DC Output Voltage	- 0.5 to $V_{CC} + 0.5$	V
$I_{IK}$	DC Input Diode Current	$\pm 20$	mA
$I_{OK}$	DC Output Diode Current	$\pm 20$	mA
$I_O$	DC Output Source Sink Current Per Output Pin	$\pm 25$	mA
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or Ground Current	$\pm 50$	mA
$P_D$	Power Dissipation	500 (*)	mW
$T_{stg}$	Storage Temperature	- 65 to 150	$^{\circ}C$

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these condition is not implied.

(\*) 500 mW:  $\equiv$  65 $^{\circ}C$  derate to 300 mW by 10 mW/ $^{\circ}C$ : 65 $^{\circ}C$  to 85 $^{\circ}C$

## RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
$V_{CC}$	Supply Voltage	2 to 6	V
$V_I$	Input Voltage	0 to $V_{CC}$	V
$V_O$	Output Voltage	0 to $V_{CC}$	V
$T_A$	Operating Temperature	74HC Series 54HC Series	$^{\circ}C$
$t_r, t_f$	Input Rise and Fall Time	$V_{CC}$ $\begin{cases} 2 \text{ V} & 0 \text{ to } 1000 \\ 4.5 \text{ V} & 0 \text{ to } 500 \\ 6 \text{ V} & 0 \text{ to } 400 \end{cases}$	ns

## DC SPECIFICATIONS

Symbol	Parameter	V <sub>CC</sub>	Test Condition	T <sub>A</sub> = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit	
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.		
V <sub>IH</sub>	High Level Input Voltage	2.0		1.5	—	—	1.5	—	1.5	—	V	
		4.5		3.15	—	—	3.15	—	3.15	—		
		6.0		4.2	—	—	4.2	—	4.2	—		
V <sub>IL</sub>	Low Level Input Voltage	2.0		—	—	0.5	—	0.5	—	0.5	V	
		4.5		—	—	1.35	—	1.35	—	1.35		
		6.0		—	—	1.8	—	1.8	—	1.8		
V <sub>OH</sub>	High Level Output Voltage	2.0	V <sub>I</sub>	I <sub>O</sub> - 20 μA	1.9	2.0	—	1.9	—	1.9	—	V
		4.5	V <sub>IH</sub> or V <sub>IL</sub>		4.4	4.5	—	4.4	—	4.4	—	
		6.0			5.9	6.0	—	5.9	—	5.9	—	
		4.5			4.18	4.31	—	4.13	—	4.10	—	
6.0				5.68	5.8	—	5.63	—	5.60	—		
V <sub>OL</sub>	Low Level Output Voltage	2.0	V <sub>IH</sub> or V <sub>IL</sub>	20 μA	—	0.0	0.1	—	0.1	—	0.1	V
		4.5			—	0.0	0.1	—	0.1	—	0.1	
		6.0			—	0.0	0.1	—	0.1	—	0.1	
		4.5				4.0 mA	—	0.17	0.26	—	0.33	
6.0				5.2 mA	—	0.18	0.26	—	0.33	—	0.40	
I <sub>I</sub>	Input Leakage Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND	—	—	±0.1	—	±1.0	—	±1.0	μA	
I <sub>CC</sub>	Quiescent Supply Current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND	—	—	2	—	20	—	40	μA	

AC ELECTRICAL CHARACTERISTICS (V<sub>CC</sub> = 5V, T<sub>A</sub> = 25°C, C<sub>L</sub> = 15pF, Input t<sub>r</sub> = t<sub>f</sub> = 6ns)

Symbol	Parameter	54HC and 74HC			Unit
		Min.	Typ.	Max.	
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time		4	8	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time CLOCK-Q, Q		15	25	ns
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time CLR., PR-Q, Q		20	31	ns
f <sub>MAX</sub>	Maximum Clock Frequency	35	62		MHz

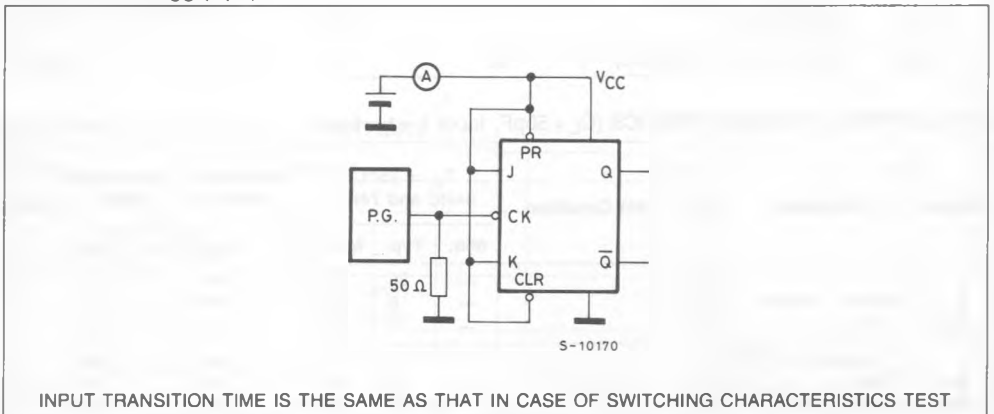
AC ELECTRICAL CHARACTERISTICS (C<sub>L</sub> = 50pF, Input t<sub>r</sub> = t<sub>f</sub> = 6ns)

Symbol	Parameter	V <sub>CC</sub>	Test Condition	T <sub>A</sub> = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t <sub>TLH</sub> t <sub>THL</sub>	Output Transition Time	2.0		—	30	75	—	95	—	110	ns
		4.5		—	8	15	—	19	—	22	
		6.0		—	7	13	—	16	—	19	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (CK - Q, Q)	2.0		—	76	145	—	180	—	220	ns
		4.5		—	18	29	—	36	—	44	
		6.0		—	15	25	—	31	—	38	

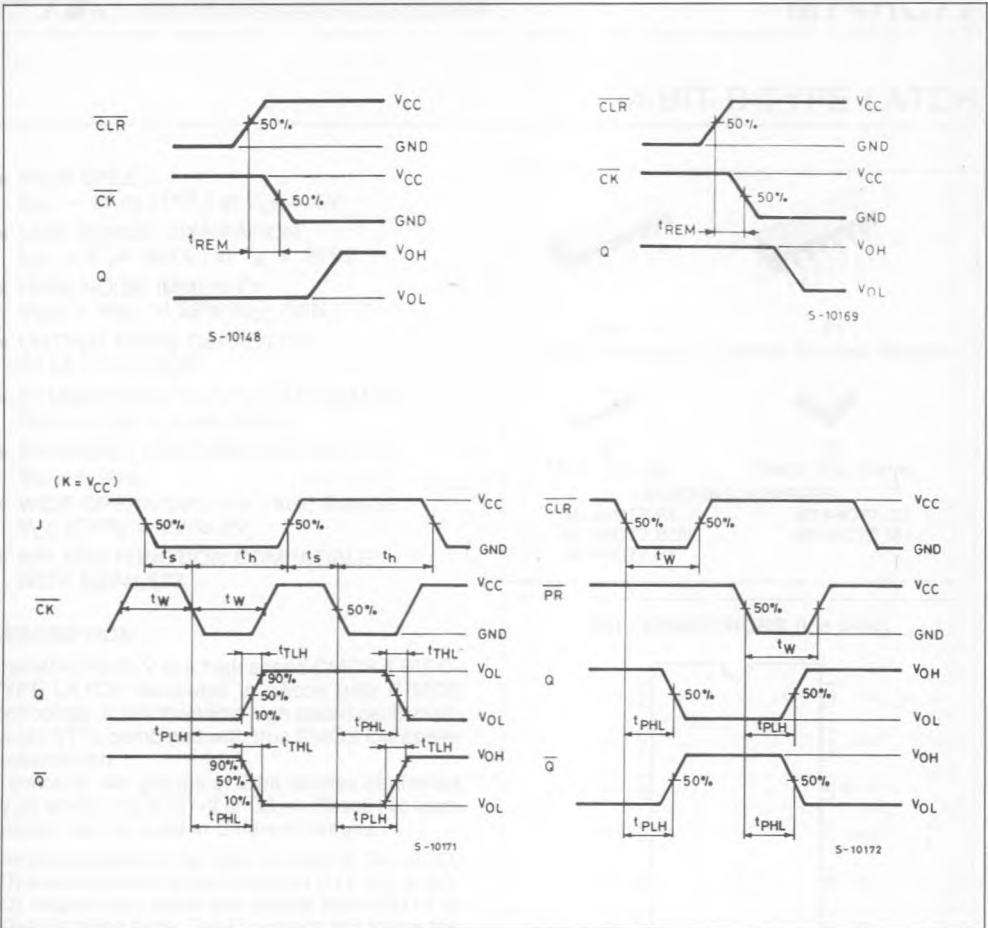
## AC ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	V <sub>CC</sub>	Test Condition	T <sub>A</sub> = 25°C 54HC and 74HC			- 40 to 85°C 74HC		- 55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t <sub>PLH</sub> t <sub>PHL</sub>	Propagation Delay Time (CLR, $\overline{PR}$ -Q, $\overline{Q}$ )	2.0		—	92	180	—	225	—	270	ns
		4.5		—	23	36	—	45	—	54	
		6.0		—	20	31	—	38	—	46	
f <sub>MAX</sub>	Maximum Clock Frequency	2.0		6	14	—	5	—	4	—	MHz
		4.5		30	55	—	24	—	20	—	
		6.0		35	65	—	28	—	24	—	
t <sub>W(H)</sub> t <sub>W(L)</sub>	Minimum Pulse Width (CLOCK)	2.0		—	30	75	—	95	—	110	ns
		4.5		—	8	15	—	19	—	22	
		6.0		—	7	13	—	16	—	19	
t <sub>W(L)</sub>	Minimum Pulse Width (CLR, $\overline{PR}$ )	2.0		—	30	75	—	95	—	110	ns
		4.5		—	8	15	—	19	—	22	
		6.0		—	7	13	—	16	—	19	
t <sub>s</sub>	Minimum Set-up Time	2.0		—	25	75	—	95	—	110	ns
		4.5		—	6	15	—	19	—	22	
		6.0		—	5	13	—	16	—	19	
t <sub>h</sub>	Minimum Hold Time	2.0		—	—	0	—	0	—	0	ns
		4.5		—	—	0	—	0	—	0	
		6.0		—	—	0	—	0	—	0	
t <sub>REM</sub>	Minimum Removal Time (CLR, $\overline{PR}$ )	2.0		—	35	100	—	125	—	150	ns
		4.5		—	9	20	—	25	—	30	
		6.0		—	8	17	—	21	—	26	
C <sub>IN</sub>	Input Capacitance			—	5	10	—	10	—	10	pF
C <sub>PD</sub> (*)	Power Dissipation Capacitance			—	47	—	—	—	—	—	pF

Note (\*) C<sub>PD</sub> is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load.

TEST CIRCUIT I<sub>CC</sub> (Opr.)

SWITCHING CHARACTERISTICS TEST WAVEFORM



INPUT AND OUTPUT EQUIVALENT CIRCUIT

