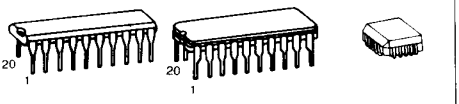
M54HCT564/574
M74HCT564/574

04662-6(564)
04 5687(574)

HS-C²MOS™ INTEGRATED CIRCUITS

PRELIMINARY DATA

OCTAL D-TYPE FLIP-FLOP WITH 3-STATE OUTPUT
M54/74HCT564 INVERTING
M54/74HCT574 NON-INVERTING



B1 Plastic Package | **F1** Ceramic Package | **C1** Chip Carrier

ORDERING NUMBERS: M54HCTXXX F1
M74HCTXXX B1
M74HCTXXX F1
M74HCTXXX C1

DESCRIPTION

The M54/74HCT564 and M54/74HCT574 are high speed CMOS OCTAL FLIP-FLOPS with 3-STATE OUTPUTS fabricated with silicon gate C²MOS technology. These ICs achieve the high speed operation similar to equivalent LSTTL while maintaining the CMOS low power dissipation.

These 8-bit D-type flip-flops are controlled by a clock input (CK) and an output enable input ($\overline{OE}$). On the positive transition of clock, the Q outputs will be set inversely to the logic state that were setup at the D inputs. While the $\overline{OE}$ input is at low level, the eight outputs will be in a normal logic state (high or low logic level), and while high level, the outputs will be in a high impedance state. The output control does not affect the internal operation of flip-flops. That is, the old data can be retained or the new data can be entered even while the outputs are off. The application engineer has a choice of combination of inverting and non-inverting outputs, symmetrical and neighboring input/output pin layout. The 3-state output configuration and the wide choice of outline will make bus-organized systems simple. All inputs are equipped with protection circuit against static discharge or transient excess voltage. These integrated circuits are totally compatible, input ad output characteristic, with standard 54/74 LSTTL logic families.

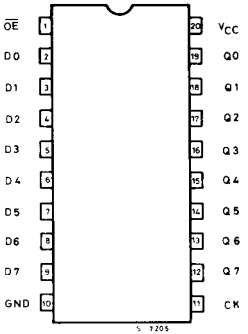
M54HCT/74HCT devices are designed to directly interface HSC²MOS system with TTL and NMOS components. These components are also plug in replacements for LSTTL devices with low power consumption.

FEATURES

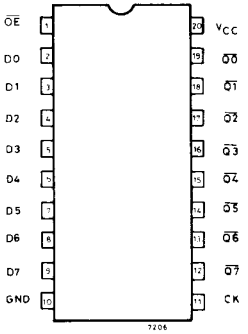
- High Speed
  f_{MAX} = 45 MHz (Typ) at V_{CC} = 5V
- Low Power Dissipation
  I_{CC} = 4 μA (Max.) at T_A = 25°C
- High Noise Immunity
  $V_{NIH} = V_{NIL}$ = 28% V_{CC} (Min.)
- Output Drive Capability
  15 LSTTL Loads
- Symmetrical Output Impedance
  $|I_{OH}| = I_{OL}$ = 6 mA (Min.)
- Balanced Propagation Delays
  $t_{PLH} = t_{PHL}$
- Pin and Function compatible with 54/74LS564/574

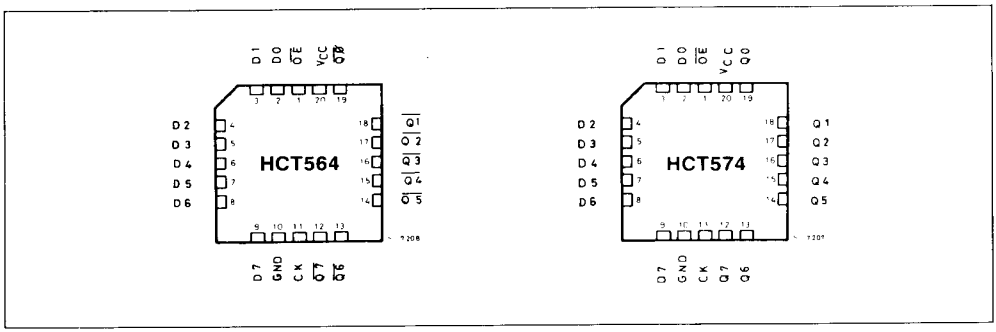
PIN CONNECTIONS
(top view)

HCT564

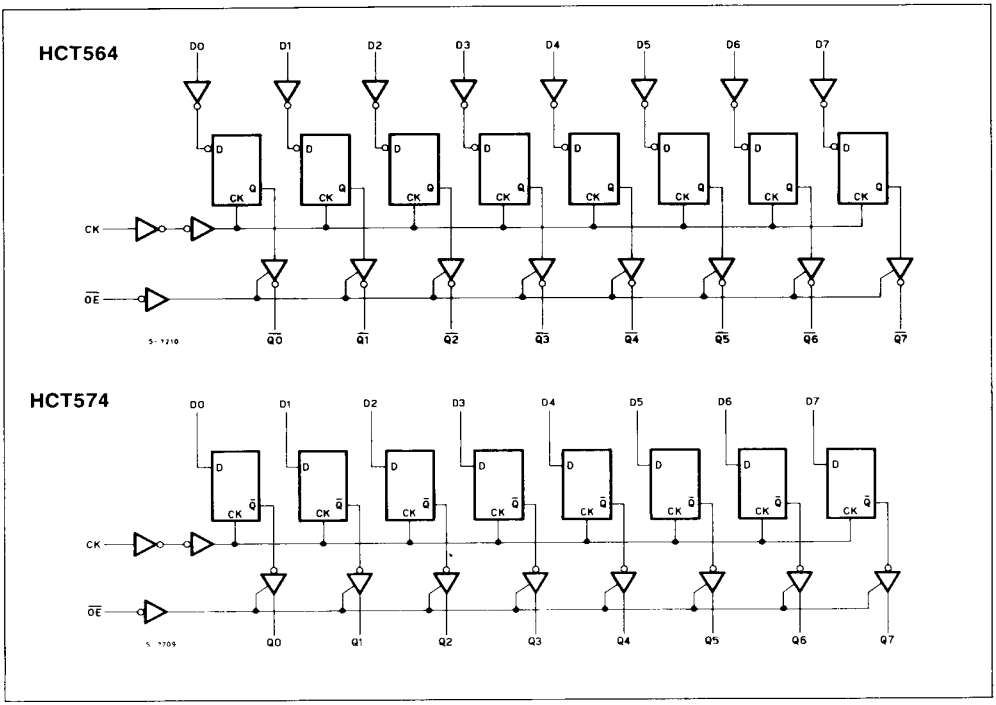


HCT574





LOGIC DIAGRAM



TRUTH TABLE

INPUTS			OUTPUTS	
$\overline{OE}$	CK	D	Q (HCT 574)	$\overline{Q}$ (HCT 564)
H	X	X	Z	Z
L	↓	X	No change	No change
L	↑	L	L	H
L	↑	H	H	L

X: Don't Care

Z: High impedance

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	± 20	mA
I_{OK}	DC Output Diode Current	± 20	mA
I_O	DC Output Source Sink Current Per Output Pin	± 35	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 70	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	−65 to 150	°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: ≅ 65°C derate to 300 mW by 10 mW/°C: 65°C to 85°C.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter		Limit		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	− 40 to 85 −55 to 125		°C
t_r, t_f	Input Rise and Fall Time	V_{CC} = 2 V V_{CC} = 4.5V V_{CC} = 6 V	0 to 1000 0 to 500 0 to 400		ns

DC SPECIFICATIONS

Symbol	Parameter	V_{CC}	Test Condition		T_A = 25°C 54HC and 74HC			−40 to 85°C 74HC		−55 to 125°C 54HC		Unit
					Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
V_{IH}	High Level Input Voltage	4.5 to 6.0			2.0 5.5	—	—	2.0	—	2	—	V
V_{IL}	Low Level Input Voltage	4.5 to 5.5			—	—	0.8	—	0.8	—	0.8	V
V_{OH}	High Level Output Voltage		V_I	I_O								
		4.5	V_{IH} or	−20 μA	4.4		—	4.4	—	4.4	—	V
		4.5	V_{IL}	−6.0 mA	4.18	4.31	—	4.13	—	4.1		
V_{OL}	Low Level Output Voltage	4.5	V_{IH} or	20 μA	—		0.1	—	0.1	—	0.1	V
		4.5	V_{IL}	6.0 mA	—	0.17	0.32	—	0.37	—	0.40	
I_I	Input Leakage Current	6.0	V_I = V_{CC} or GND				±0.1		±1.0		±1	μA
I_{OZ}	3 State Output Current	5.5					±0.5		±5.0	—	±10	μA
I_{CC}	Quiescent Supply Current	6.0	V_I = V_{CC} or GND				4		40		80	μA

AC ELECTRICAL CHARACTERISTICS (V_{CC} = 5V, T_A = 25°C, C_L = 15pF, Input $t_r = t_f$ = 6ns)

Symbol	Parameter	CL (pF)	54HC and 74HC			Unit
			MIN.	TYP.	MAX.	
t_{TLH} t_{THL}	Output Transition Time	50		7	11	ns
t_{PLH} t_{PHL}	Propagation Delay Time CK-Q (HCT564)	50		24	38	ns
t_{PLH} t_{PHL}	Propagation Delay Time CK-Q (HCT574)	50		24	38	ns
f_{MAX}	Maximum Clock Frequency	50	24	41		MHz
$t_{W(H)}$ $t_{W(L)}$	Minimum Pulse Width CK	50		10	20	ns

AC ELECTRICAL CHARACTERISTICS (Continued)

Symbol	Parameter	CL (pF)	54HC and 74HC			Unit
			MIN.	TYP.	MAX.	
t_s	Minimum Set-up Time D-CK	50		6	15	ns
t_h	Minimum Hold Time D-CK	50		—	5	ns
t_{PZL} t_{PZH}	3-State Output Enable Time	50		21	33	ns
t_{PLZ} t_{PHZ}	3-State Output Disable Time	5		16	26	ns

AC ELECTRICAL CHARACTERISTICS ($C_L = 50pF$, Input $t_r = t_f = 6ns$)

Symbol	Parameter	V_{CC}	Test Condition	T_A = 25°C 54HC and 74HC			−40 to 85°C 74HC		−55 to 125°C 54HC		Unit
				Min.	Typ.	Max.	Min.	Max.	Min.	Max.	
t_{TLH} t_{THL}	Output Transition Time	4.5		—	7	12	—	15			ns
t_{PLH}	Propagation Delay	4.5		—	26	41	—	50			ns