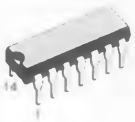
SGS-THOMSON MICROELECTRONICS

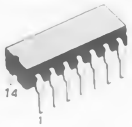
M54HCT04
M74HCT04

HEX INVERTER

- LOW POWER DISSIPATION
  I_{CC} = 1 μA (MAX.) at T_A = 25°C
- HIGH NOISE IMMUNITY
  V_{NIH} = V_{NIL} = 28% V_{CC} (MIN.)
- OUTPUT DRIVE CAPABILITY
  10 LSTTL LOADS
- SYMMETRICAL OUTPUT IMPEDANCE
  $|I_{OH}|$ = I_{OL} = 4 mA (MIN.)
- BALANCED PROPAGATION DELAYS
  t_{PLH} = t_{PHL}
- PIN AND FUNCTION COMPATIBLE
  WITH 54/74LS04



B1N
Plastic Package



F1
Ceramic Frit Seal Package

M1
Micro Package

C1
Plastic Chip Carrier

ORDERING NUMBERS:

M54HCT04 F1	M74HCT04 C1
M74HCT04 B1N	M74HCT04 M1
M74HCT04 F1	

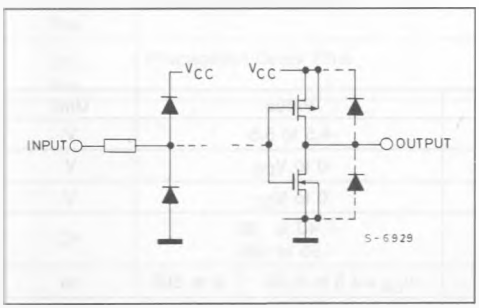
DESCRIPTION

The M54/74HCT04 is a high speed CMOS INVERTER fabricated in silicon gate C²MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption.

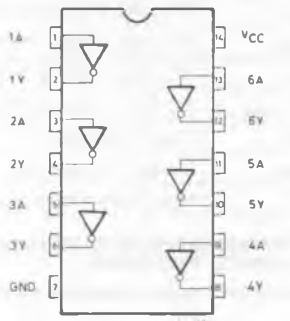
The internal circuit is composed of 3 stages including buffered output, which gives high noise immunity and a stable output.
All inputs are equipped with protection circuits against static discharge and transient excess voltage. This integrated circuit has input and output characteristic that are fully compatible with 54/74 LSTTL logic families.

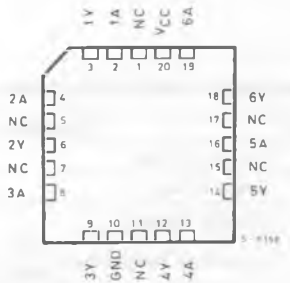
M54HCT/74HCT devices are designed to directly interface HSC²MOS systems with TTL and NMOS components. They are also plug in replacements for LSTTL devices giving a reduction of power consumption.

INPUT AND OUTPUT EQUIVALENT CIRCUIT



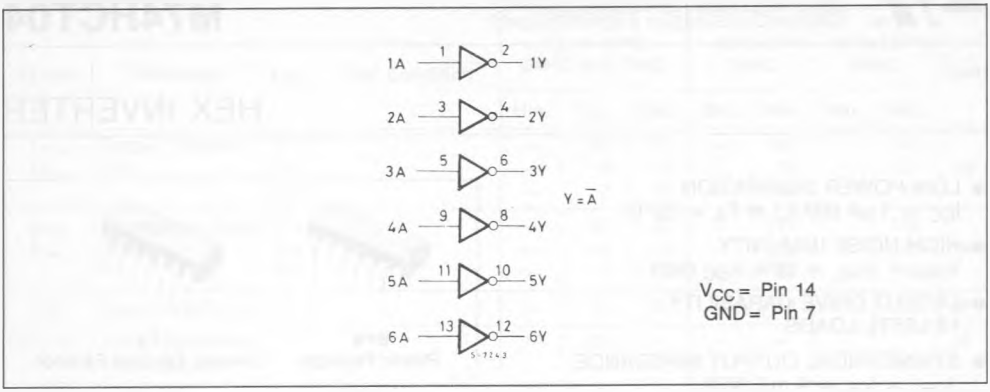
PIN CONNECTIONS (top view)





NC =
No Internal
Connection

LOGIC DIAGRAM



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	± 25	mA
I_{CC} or I_{GND}	DC V_{CC} or Ground Current	± 50	mA
P_D	Power Dissipation	500 (*)	mW
T_{stg}	Storage Temperature	− 65 to 150	°C
T_L	Lead Temperature (10 sec)	300	°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	Value		Unit
V_{CC}	Supply Voltage	4.5 to 5.5		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} = 4.5 to 5.5V	0 to 500	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 5.5			— 2.0 —	— — —	— — —	— 2.0 —	— — —	— 2.0 —	— — —	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}	−20 μA	4.4	4.5	—	4.4	—	4.4	—	V
		4.5	or V_{IL}	−4.0 mA	4.18	4.31	—	4.13	—	4.10		
V_{OL}	Low Level Output Voltage		V_I	I_O								
		4.5	V_{IH}	20 μA	—	0.0	0.1	—	0.1	—	0.1	V
		4.5	or V_{IL}	4.0 mA	—	0.17	0.26	—	0.33	—	0.40	
I_I	Input Leakage Current	5.5	$V_I = V_{CC}$ or GND		—	—	±0.1	—	±1.0	—	±1.0	μA
I_{CC}	Quiescent Supply Current	5.5	$V_{IN} = V_{CC}$ or GND		—	—	1	—	10	—	20	μA
ΔI_{CC}	Additional worst case supply current	5.5	Per Input pin $V_{IN} = 2.4V$ Other Inputs at V_{CC} or GND $I_O = 0$		—	—	2.0	—	2.9	—	3.0	mA

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

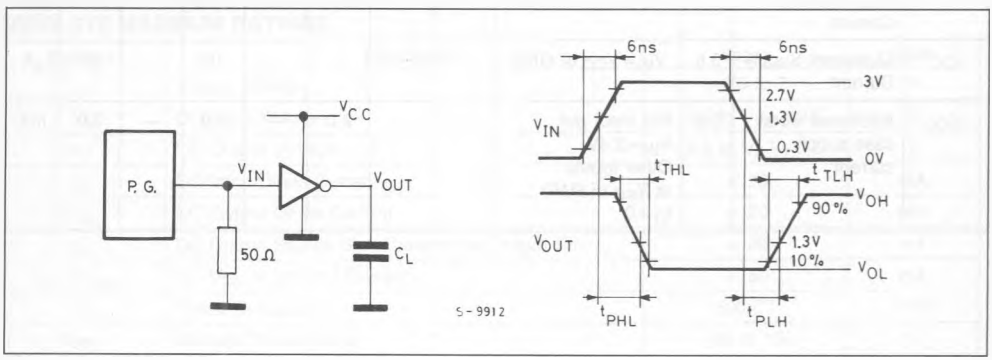
Symbol	Parameter	54HC and 74HC			Unit
		Min.	Typ.	Max.	
t_{TLH} t_{THL}	Output Transition Time		4	8	ns
t_{PLH} t_{PHL}	Propagation Delay Time		10	17	ns

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}	Output Transition Time	4.5		—	8	15	—	19	—	22	ns
t_{PLH} t_{PHL}	Propagation Delay Time	4.5		—	13	20	—	25	—	30	ns
C_{IN}	Input Capacitance			—	5	10	—	10	—	10	pF
C_{PD} (*)	Power Dissipation Capacitance			—	25	—	—	—	—	—	pF

Note (*) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load (refer to Test circuit).
Average operating current can be obtained by the following equation: $I_{CC(opr.)} = C_{PD} \cdot V_{CC} \cdot f_{IN} + I_{CC}/6$

SWITCHING CHARACTERISTICS TEST CIRCUIT



TEST CIRCUIT I_{CC} (Opr.)