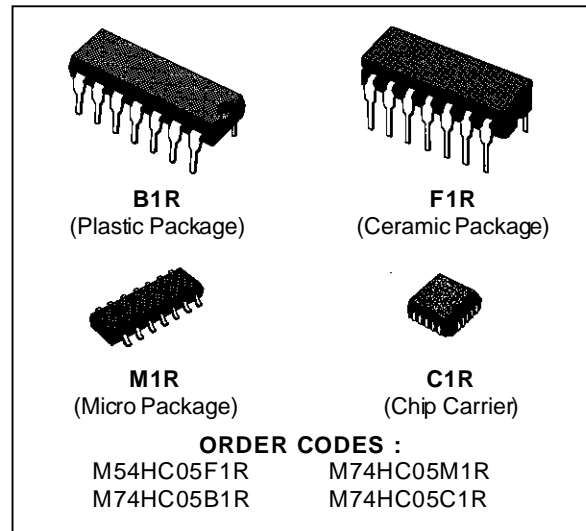


## HEX INVERTER (OPEN DRAIN)

- HIGH SPEED  
 $t_{PD} = 8 \text{ ns}$  (TYP.) AT  $V_{CC} = 5 \text{ V}$
- LOW POWER DISSIPATION  
 $I_{CC} = 1 \mu\text{A}$  (MAX.) AT  $T_A = 25 \text{ }^\circ\text{C}$
- HIGH NOISE IMMUNITY  
 $V_{NIH} = V_{NIL} = 28 \% V_{CC}$  (MIN.)
- OUTPUT DRIVE CAPABILITY  
 10 LSTTL LOADS
- WIDE OPERATING VOLTAGE RANGE  
 $V_{CC} \text{ (OPR)} = 2 \text{ V TO } 6 \text{ V}$
- PIN AND FUNCTION COMPATIBLE WITH  
 54/74LS05

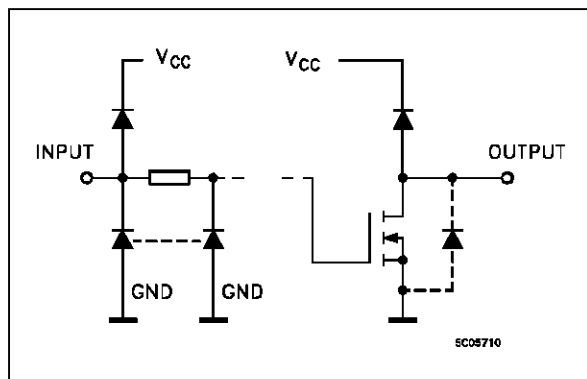


### DESCRIPTION

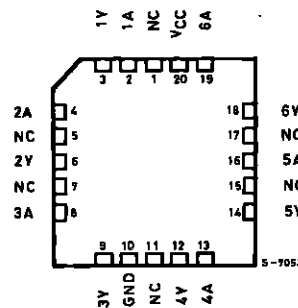
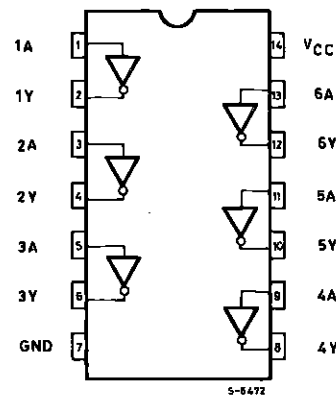
The M54/74HC05 is a high speed CMOS HEX OPEN DRAIN INVERTER fabricated in silicon gate C<sup>2</sup>MOS technology. It has the same high speed performance of LSTTL combined with true CMOS low power consumption.

The internal circuit is composed of 3 stages including buffer output, which enables high noise immunity and stable output. All inputs are equipped with circuits against static discharge and transient excess voltage.

### INPUT AND OUTPUT EQUIVALENT CIRCUIT



### PIN CONNECTIONS (top view)



NC =  
No Internal  
Connection

## M54/M74HC05

### TRUTH TABLE

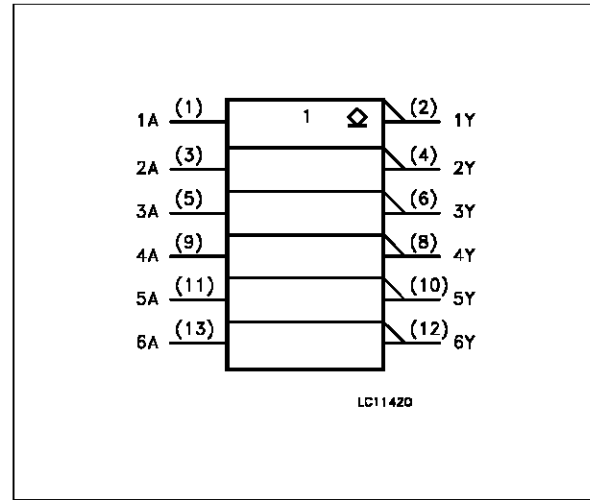
A	Y
L	Z
H	L

Z = High impedance

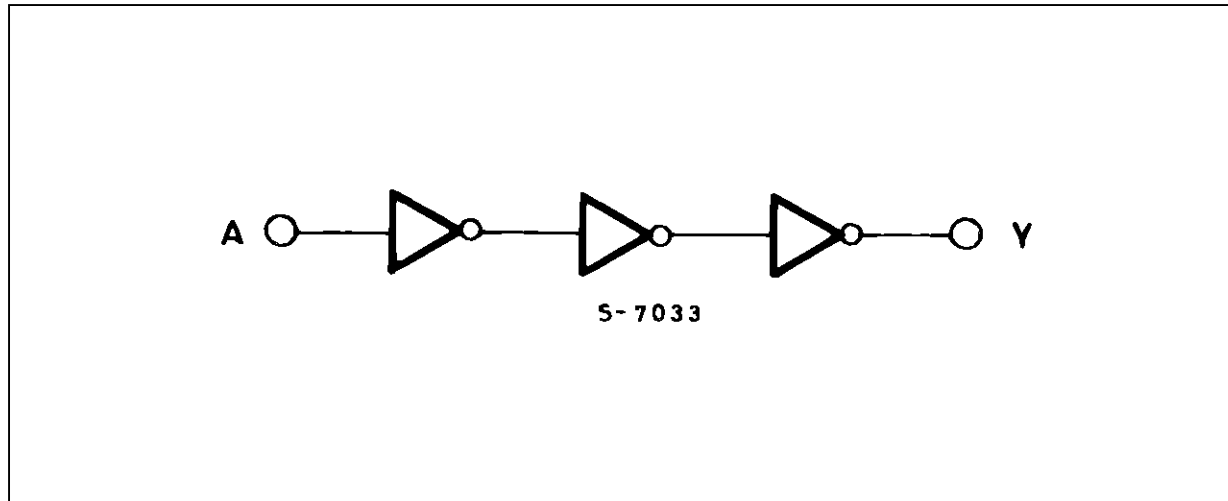
### PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
1, 3, 5, 9, 11, 13	1A to 6A	Data Inputs
2, 4, 6, 8, 10, 12	1Y to 6Y	Data Outputs
7	GND	Ground (0V)
14	V <sub>CC</sub>	Positive Supply Voltage

### IEC LOGIC SYMBOL



### LOGIC DIAGRAM (Per Gate)



### ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V <sub>CC</sub>	Supply Voltage	-0.5 to +7	V
V <sub>I</sub>	DC Input Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
V <sub>O</sub>	DC Output Voltage	-0.5 to V <sub>CC</sub> + 0.5	V
I <sub>IK</sub>	DC Input Diode Current	± 20	mA
I <sub>OK</sub>	DC Output Diode Current	± 20	mA
I <sub>O</sub>	DC Output Sink Current Per Output Pin	25	mA
I <sub>CC</sub> or I <sub>GND</sub>	DC V <sub>CC</sub> or Ground Current	± 50	mA
P <sub>D</sub>	Power Dissipation	500 (*)	mW
T <sub>stg</sub>	Storage Temperature	-65 to +150	°C
T <sub>L</sub>	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 10mW/°C: 65 °C to 85 °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
$T_{op}$	Operating Temperature: <b>M54HC Series</b> <b>M74HC Series</b>	-55 to +125 -40 to +85	°C °C
$t_r, t_f$	Input Rise and Fall Time	$V_{CC} = 2\text{ V}$	0 to 1000
		$V_{CC} = 4.5\text{ V}$	0 to 500
		$V_{CC} = 6\text{ V}$	0 to 400

## DC SPECIFICATIONS

Symbol	Parameter	Test Conditions		Value						Unit	
				$T_A = 25\text{ °C}$ 54HC and 74HC			$-40\text{ to }85\text{ °C}$ 74HC		$-55\text{ to }125\text{ °C}$ 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$V_{IH}$	High Level Input Voltage	2.0 4.5 6.0		1.5			1.5		1.5		V
				3.15			3.15		3.15		
				4.2			4.2		4.2		
$V_{IL}$	Low Level Input Voltage	2.0 4.5 6.0				0.5		0.5		0.5	V
						1.35		1.35		1.35	
						1.8		1.8		1.8	
$V_{OL}$	Low Level Output Voltage	2.0 4.5 6.0 4.5 6.0	$V_I = V_{IH}$ or $V_{IL}$	$I_O = 20\text{ }\mu\text{A}$  $I_O = 4.0\text{ mA}$  $I_O = 5.2\text{ mA}$	0.0	0.1		0.1		0.1	V
					0.0	0.1		0.1		0.1	
					0.0	0.1		0.1		0.1	
					0.17	0.26		0.33		0.40	
					0.18	0.26		0.33		0.40	
$I_I$	Input Leakage Current	6.0	$V_I = V_{CC}$ or GND			$\pm 0.1$		$\pm 1$		$\pm 1$	$\mu\text{A}$
$I_{OZ}$	Output Leakage Current	6.0	$V_I = V_{IH}$ or $V_{IL}$ $V_O = V_{CC}$ or GND			$\pm 0.5$		$\pm 5$		$\pm 10$	$\mu\text{A}$
$I_{CC}$	Quiescent Supply Current	6.0	$V_I = V_{CC}$ or GND			1		10		20	$\mu\text{A}$

## M54/M74HC05

### AC ELECTRICAL CHARACTERISTICS ( $C_L = 50 \text{ pF}$ , Input $t_r = t_f = 6 \text{ ns}$ )

Symbol	Parameter	Test Conditions		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C 54HC and 74HC			-40 to 85 °C 74HC		-55 to 125 °C 54HC		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
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>PLZ</sub>	Propagation Delay Time	2.0	R <sub>L</sub> = 1KΩ		20	90		115		135	ns
		4.5			11	18		23		27	
		6.0			10	15		20		23	
t <sub>PZL</sub>	Propagation Delay Time	2.0	R <sub>L</sub> = 1KΩ		33	90		115		135	ns
		4.5			9	18		23		27	
		6.0			8	15		20		23	
C <sub>IN</sub>	Input Capacitance				5	10		10		10	pF
C <sub>OUT</sub>	Output Capacitance				10						pF
C <sub>PD</sub> (*)	Power Dissipation Capacitance				6.5						pF

(\*) 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.

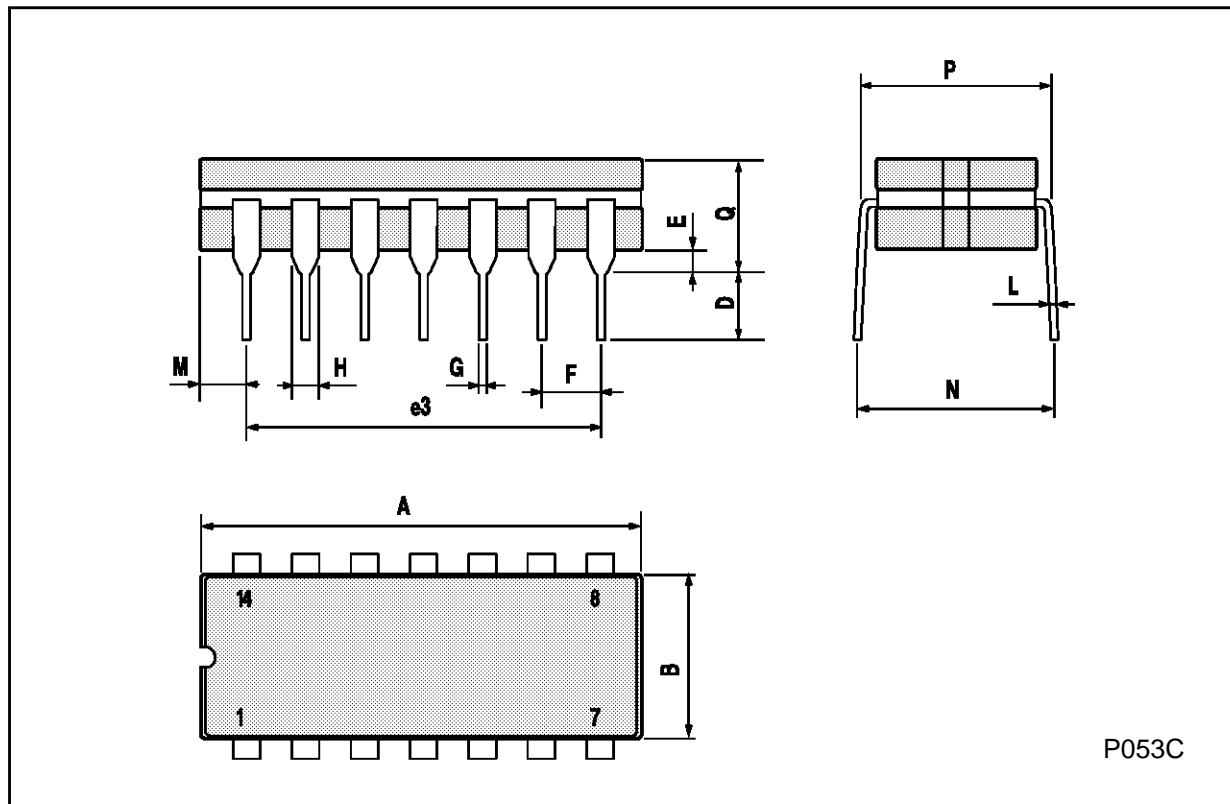
## Plastic DIP14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	1.39		1.65	0.055		0.065
b		0.5			0.020	
b1		0.25			0.010	
D			20			0.787
E		8.5			0.335	
e		2.54			0.100	
e3		15.24			0.600	
F			7.1			0.280
I			5.1			0.201
L		3.3			0.130	
Z	1.27		2.54	0.050		0.100



Ceramic DIP14/1 MECHANICAL DATA

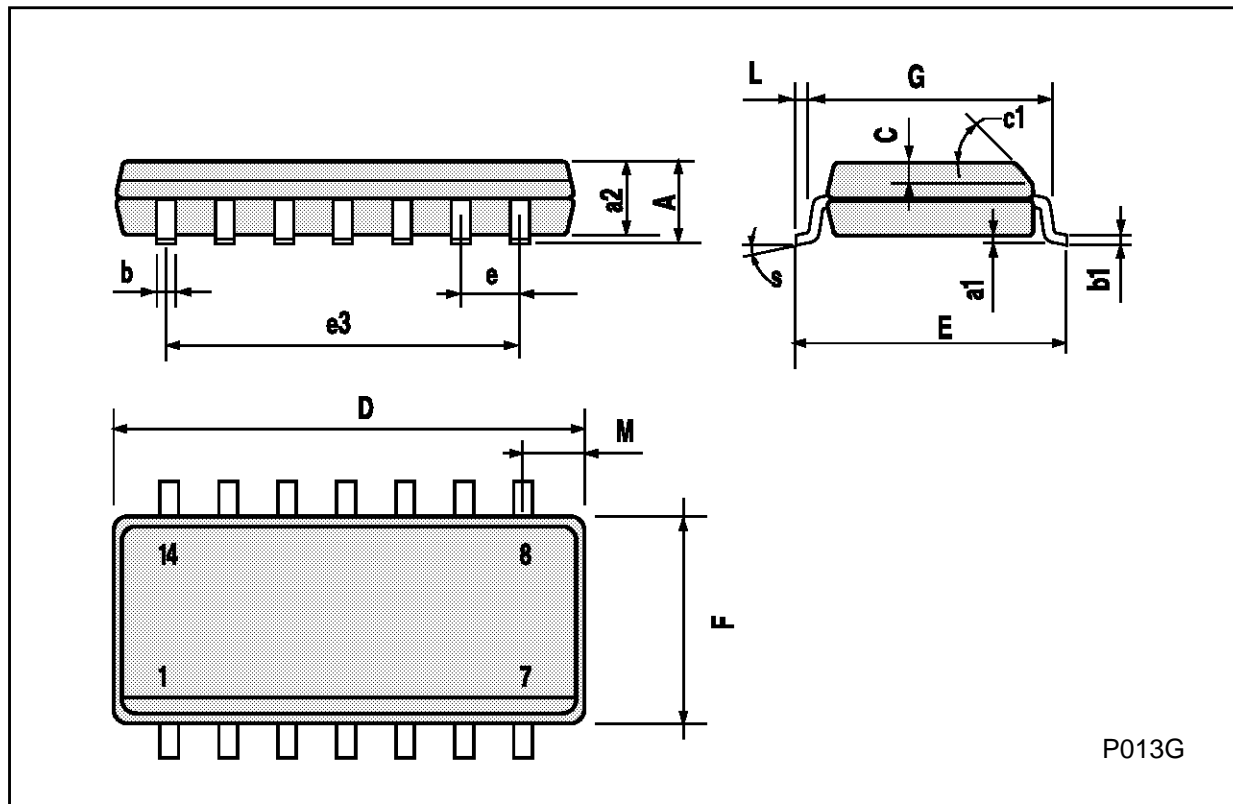
DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			20			0.787
B			7.0			0.276
D		3.3			0.130	
E	0.38			0.015		
e3		15.24			0.600	
F	2.29		2.79	0.090		0.110
G	0.4		0.55	0.016		0.022
H	1.17		1.52	0.046		0.060
L	0.22		0.31	0.009		0.012
M	1.52		2.54	0.060		0.100
N			10.3			0.406
P	7.8		8.05	0.307		0.317
Q			5.08			0.200



P053C

## SO14 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A			1.75			0.068
a1	0.1		0.2	0.003		0.007
a2			1.65			0.064
b	0.35		0.46	0.013		0.018
b1	0.19		0.25	0.007		0.010
C		0.5			0.019	
c1	45° (typ.)					
D	8.55		8.75	0.336		0.344
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		7.62			0.300	
F	3.8		4.0	0.149		0.157
G	4.6		5.3	0.181		0.208
L	0.5		1.27	0.019		0.050
M			0.68			0.026
S	8° (max.)					



PLCC20 MECHANICAL DATA

DIM.	mm			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
A	9.78		10.03	0.385		0.395
B	8.89		9.04	0.350		0.356
D	4.2		4.57	0.165		0.180
d1		2.54			0.100	
d2		0.56			0.022	
E	7.37		8.38	0.290		0.330
e		1.27			0.050	
e3		5.08			0.200	
F		0.38			0.015	
G			0.101			0.004
M		1.27			0.050	
M1		1.14			0.045	





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