



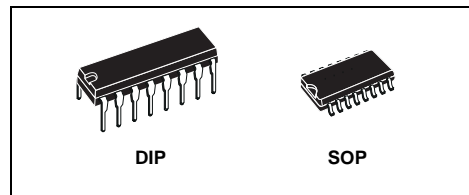
HCF4009UB

HEX BUFFER/CONVERTER (INVERTING)

- PROPAGATION DELAY TIME $t_{pD} = 40\text{ns}$ (TYP.) at $V_{DD} = 10\text{V}$ $C_L = 50\text{pF}$
- HIGH TO LOW LEVEL LOGIC CONVERSION
- MULTIPLEXER: 1 TO 6 OR 6 TO 1
- HIGH "SINK" AND "SOURCE" CURRENT CAPABILITY
- QUIESCENT CURRENT SPECIFIED UP TO 20V
- 5V, 10V AND 15V PARAMETRIC RATINGS
- INPUT LEAKAGE CURRENT
 $I_l = 100\text{nA}$ (MAX) AT $V_{DD} = 18\text{V}$ $T_A = 25^\circ\text{C}$
- 100% TESTED FOR QUIESCENT CURRENT
- MEETS ALL REQUIREMENTS OF JEDEC JESD13B "STANDARD SPECIFICATIONS FOR DESCRIPTION OF B SERIES CMOS DEVICES"

DESCRIPTION

The HCF4009UB is a monolithic integrated circuit fabricated in Metal Oxide Semiconductor technology available in DIP and SOP packages.



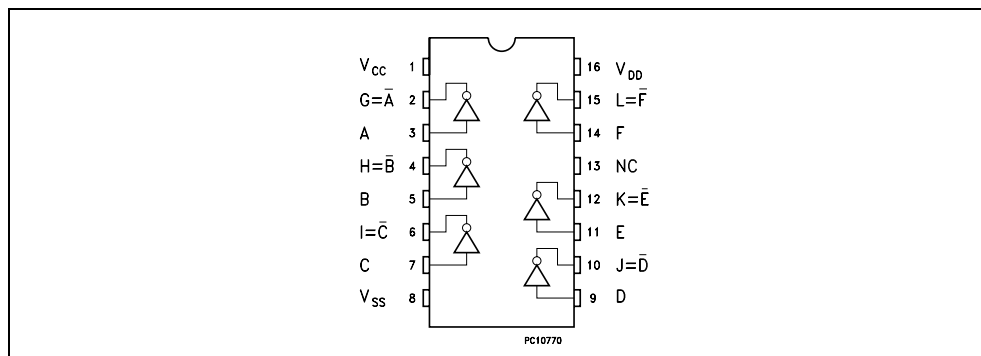
ORDER CODES

PACKAGE	TUBE	T & R
DIP	HCF4009UBEY	
SOP	HCF4009UBM1	HCF4009UM013TR

It is an inverting Hex Buffer/Converter and can be used as CMOS to TTL or DTL logic level converters as current "sink" or "source" drivers or as multiplexer (1 to 6).

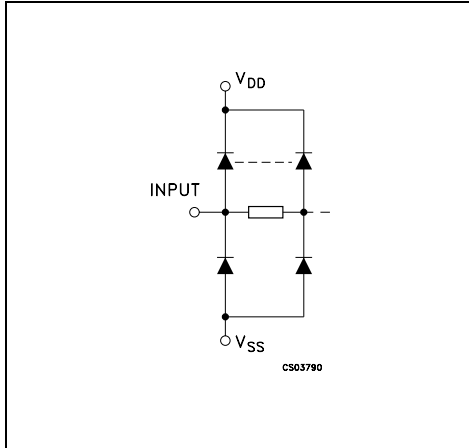
It is a preferred replacement of HCF4049UB in buffer applications.

PIN CONNECTION



HCF4009UB

INPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

PIN No	SYMBOL	NAME AND FUNCTION
3, 5, 7, 9, 11, 14	A, B, C, D, E, F	Data Inputs
2, 4, 6, 10, 12, 15	G, H, I, J, K, L	Data Outputs
13	NC	Not Connected
1	V _{CC}	Positive Supply Voltage
8	V _{SS}	Negative Supply Voltage
16	V _{DD}	Positive Supply Voltage

TRUTH TABLE

INPUTS	OUTPUTS
A, B, C, D, E, F	G, H, I, J, K, L
L	H
H	L

ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DD}	Supply Voltage	-0.5 to +22	V
V _{CC}	Supply Voltage	0.5 to V _{DD} + 0.5	V
V _I	DC Input Voltage	-0.5 to V _{DD} + 0.5	V
I _I	DC Input Current	± 10	mA
P _D	Power Dissipation per Package	200	mW
	Power Dissipation per Output Transistor	100	mW
T _{op}	Operating Temperature	-55 to +125	°C
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 conditions is not implied.

All voltage values are referred to V_{SS} pin voltage.

RECOMMENDED OPERATING CONDITIONS

Symbol	Parameter	Value	Unit
V _{DD}	Supply Voltage	3 to 20	V
V _{CC}	Supply Voltage	0 to V _{DD}	V
V _I	Input Voltage	0 to V _{DD}	V
T _{op}	Operating Temperature	-55 to 125	°C

This device has High to Low level voltage conversion capability only

DC SPECIFICATION

Symbol	Parameter	Test Condition				Value						Unit	
		V _I (V)	V _O (V)	I _{OL} (μ A)	V _{DD} (V)	T _A = 25°C			-40 to 85°C		-55 to 125°C		
						Min.	Typ.	Max.	Min.	Max.	Min.		Max.
I _L	Quiescent Current	0/5			5		0.02	1		30		30	μ A
		0/10			10		0.02	2		60		60	
		0/15			15		0.02	4		120		120	
		0/20			20		0.04	20		600		600	
V _{OH}	High Level Output Voltage	0/5		<1	5	4.95			4.95		4.95		V
		0/10		<1	10	9.95			9.95		9.95		
		0/15		<1	15	14.95			14.95		14.95		
V _{OL}	Low Level Output Voltage	5/0		<1	5		0.05			0.05		0.05	V
		10/0		<1	10		0.05			0.05		0.05	
		15/0		<1	15		0.05			0.05		0.05	
V _{IH}	High Level Input Voltage		0.5/4.5	<1	5	4			4		4		V
			1/9	<1	10	8			8		8		
			1.5/13.5	<1	15	12.5			12.5		12.5		
V _{IL}	Low Level Input Voltage		4.5/0.5	<1	5			1		1		1	V
			9/1	<1	10			2		2		2	
			13.5/1.5	<1	15			2.5		2.5		2.5	
I _{OH}	Output Drive Current	0/5	2.5	<1	5	-0.8	-1.6		-0.65		-0.65		mA
		0/5	4.6	<1	5	-0.2	-0.4		-0.18		-0.18		
		0/10	9.5	<1	10	-0.45	-0.9		-0.38		-0.38		
		0/15	13.5	<1	15	-1.5	-3		-1.25		-1.25		
I _{OL}	Output Sink Current	0/5	0.4	<1	5	3	4		0.36		0.36		mA
		0/10	0.5	<1	10	8	10		6.4		6.4		
		0/15	1.5	<1	15	24	36		1.9		1.9		
I _I	Input Leakage Current	0/18	Any Input		18		$\pm 10^{-5}$	± 0.1		± 1		± 1	μ A
C _I	Input Capacitance		Any Input				15	22.6					pF

The Noise Margin for both "1" and "0" level is: 1V min. with V_{DD}=5V, 2V min. with V_{DD}=10V, 2.5V min. with V_{DD}=15V

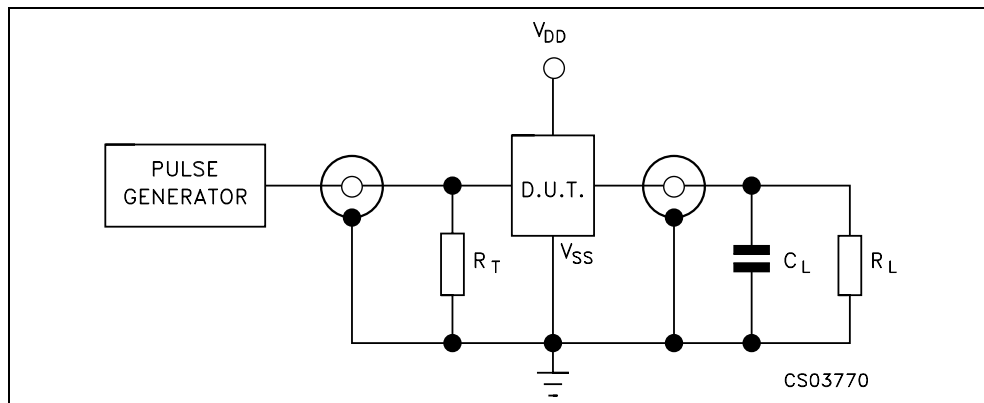
HCF4009UB

DYNAMIC ELECTRICAL CHARACTERISTICS ($T_{amb} = 25^{\circ}\text{C}$, $C_L = 50\text{pF}$, $R_L = 200\text{K}\Omega$, $t_r = t_f = 20\text{ ns}$)

Symbol	Parameter	Test Condition			Value (*)			Unit
		V_{DD} (V)	V_I (V)	V_{CC} (V)	Min.	Typ.	Max.	
t_{TLH}	Output Transition Time	5	5	5		150	350	ns
		10	10	10		75	15	
		15	15	15		55	110	
t_{THL}	Output Transition Time	5	5	5		35	70	ns
		10	10	10		20	40	
		15	15	15		15	30	
t_{PLH}	Propagation Delay Time	5	5	5		70	140	ns
		10	10	10		40	80	
		10	10	5		35	70	
		15	15	15		30	60	
		15	15	5		30	600	
t_{PHL}	Propagation Delay Time	5	5	5		30	60	ns
		10	10	10		20	40	
		10	10	5		15	30	
		15	15	15		15	30	
		15	15	5		10	20	

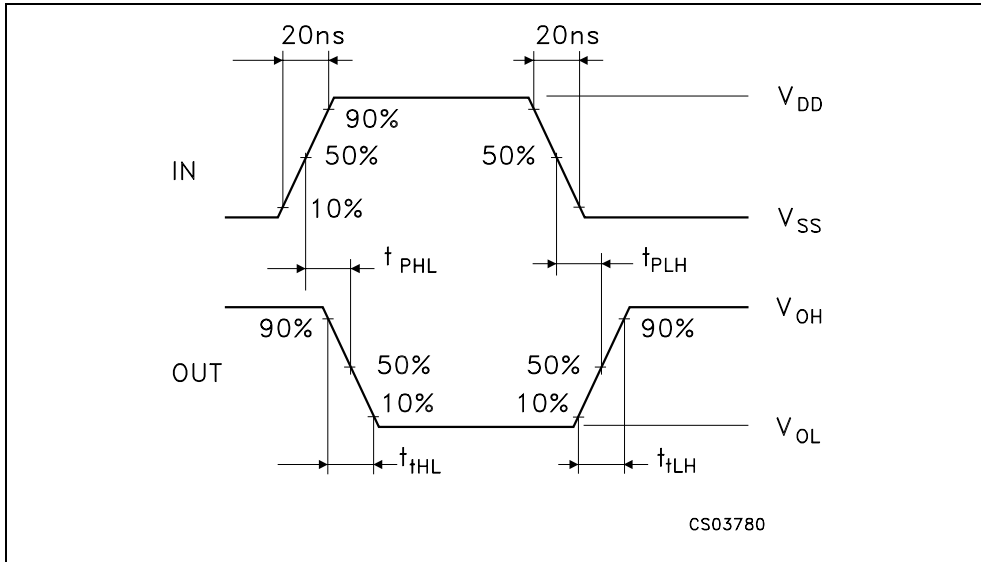
(*) Typical temperature coefficient for all V_{DD} value is 0.3 %/°C.

TEST CIRCUIT



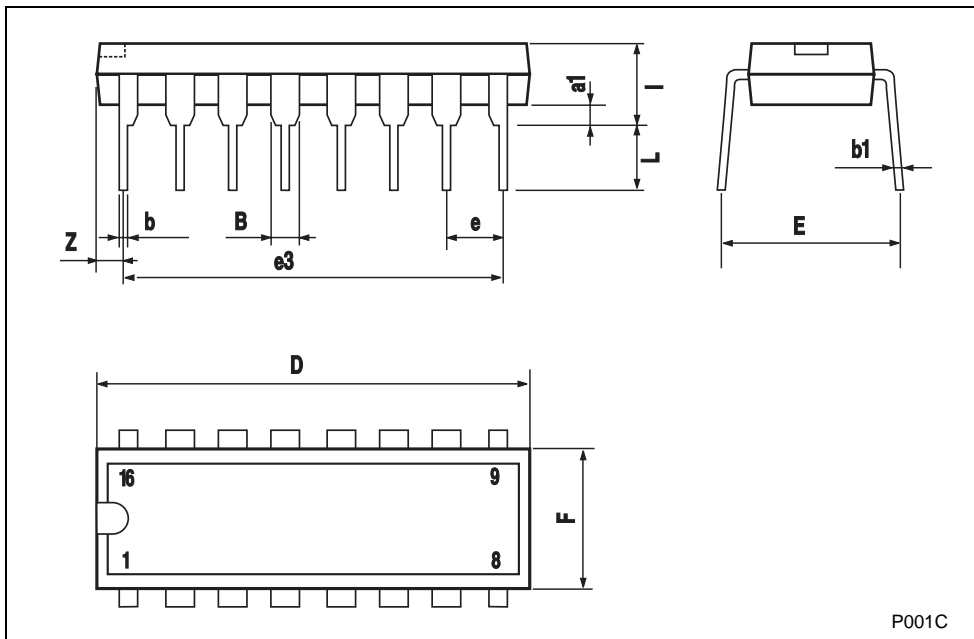
$C_L = 50\text{pF}$ or equivalent (includes jig and probe capacitance)
 $R_L = 200\text{K}\Omega$
 $R_T = Z_{OUT}$ of pulse generator (typically 50Ω)

WAVEFORM 1: PROPAGATION DELAY TIMES (f=1MHz; 50% duty cycle)



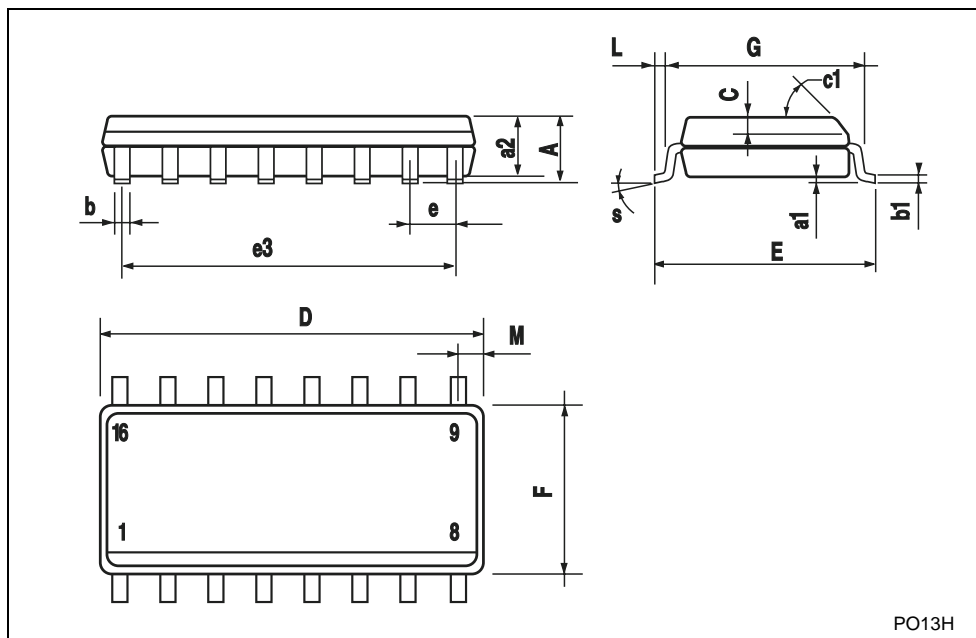
Plastic DIP-16 (0.25) MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP.	MAX.	MIN.	TYP.	MAX.
a1	0.51			0.020		
B	0.77		1.65	0.030		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		17.78			0.700	
F			7.1			0.280
l			5.1			0.201
L		3.3			0.130	
Z			1.27			0.050



SO-16 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	9.8		10	0.385		0.393
E	5.8		6.2	0.228		0.244
e		1.27			0.050	
e3		8.89			0.350	
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			0.62			0.024
S	8° (max.)					



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