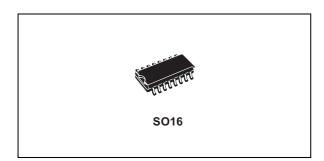


Hex buffer/converter (non-inverting)

Datasheet - production data



Features

- · Propagation delay time
 - t_{PD} = 50 ns (typ.) at V_{DD} = 10 V, C_L = 50 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 20 V
- 5 V, 10 V and 15 V parametric ratings
- · Input leakage current
- I_I = 100 nA (max.) at V_{DD} = 18 V, T_A = 25 °C 100% tested for quiescent current
- ESD performance

CDM: 1 kVHBM: 1 kVMM: 150 V

Applications

- Automotive
- Industrial
- Computer
- Consumer

Description

The HCF4010 device is a monolithic integrated circuit fabricated in MOS (metal oxide semiconductor) technology available in an SO16 package.

It is a non-inverting hex buffer/converter and can be used as a CMOS to TTL logic level converter, as a current "sink" or "source" driver, or as a multiplexer (1 to 6).

It is the preferred replacement of the HCF4050B in buffer applications.

Table 1. Device summary

Order code	Temperature range	Package	Packing	Marking
HCF4010M013TR	–55 °C to +125 °C	SO16	Tape and reel	HCF4010
HCF4010YM013TR ⁽¹⁾	–40 °C to +125 °C	SO16 (automotive grade)	Tape and Teel	HCF4010Y

Qualification and characterization according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q002 or equivalent.

Contents HCF4010

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HCF4010 Pin information

1 Pin information

Figure 1. Pin connections

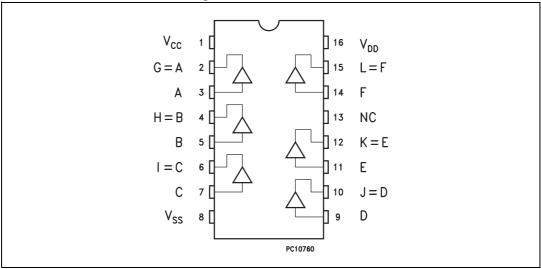


Table 2. Pin description

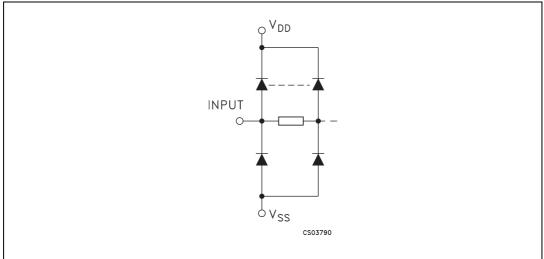
Pin number	Symbol/name	Function
3, 5, 7, 9, 11, 14	A, B, C, D, E, F	Data inputs
2, 4, 6, 10, 12, 15	G, H, I, J, K, L	Data outputs
13	NC	Not connected
1	V _{CC}	Positive supply voltage
8	V _{SS}	Negative supply voltage
16	V _{DD}	Positive supply voltage

2 Functional description

Table 3. Truth table

Inputs (A, B, C, D, E, F)	Outputs (G, H, I, J, K, L)
L	L
Н	Н

Figure 2. Input equivalent circuit



3 Electrical characteristics

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 $V_{\rm SS}$ pin voltage.

Table 4. Absolute maximum ratings

Symbol	Parameter	Value	Unit
V_{DD}	Supply voltage	-0.5 to +22	V
VI	DC Input voltage	-0.5 to V _{DD} + 0.5	V
I _I	DC input current	±10	mA
В	Power dissipation per package	200	mW
P_{D}	Power dissipation per output transistor	100	IIIVV
T _{op}	Operating temperature	-55 to +125	°C
T _{stg}	Storage temperature	-65 to +150	

Table 5. Recommended operating conditions

Symbol	Par	Value	Unit	
V_{DD}	Supply voltage	3 to 20	V	
V _I	Input voltage	0 to V _{DD}	V	
T Operating temperature		SO16	-55 to 125	°C
T _{op}	Operating temperature	SO16 (automotive grade)	-40 to 125	

Electrical characteristics HCF4010

Table 6. DC specifications⁽¹⁾

	Test condition		ion	Value									
Sym.	Parameter	Vı	v _o	I _O	$V_{DD} = V_{CC}$	T	\ = 25 °	C.	-40 to	85 °C	-55 to	125 °C	Unit
		(V)	(V)	(μ A)	(V)	Min.	Тур.	Max.	Min.	Max.	Min.	Max.	
		0/5			5		0.02	1		30		30	
	Quiescent	0/10			10		0.02	2		60		60	μA
ΙL	current	0/15			15		0.02	4		120		120	μΑ
		0/20			20		0.04	20		600		600	
		0/5		<1	5	4.95			4.95		4.95		
V _{OH}	High-level output voltage	0/10		<1	10	9.95			9.95		9.95		
	output voltage	0/15		<1	15	14.95			14.95		14.95		
		5/0		<1	5		0.05			0.05		0.05	
V _{OL}	Low-level output voltage	10/0		<1	10		0.05			0.05		0.05	
	oatpat voltage	15/0		<1	15		0.05			0.05		0.05	V
			0.5/4.5	<1	5	3.5			3.5		3.5		V
V _{IH}	High-level input voltage		1/9	<1	10	7			7		7		
	Vollage		1.5/13.5	<1	15	11			11		11		
			4.5/0.5	<1	5			1.5		1.5		1.5	
V _{IL}	Low-level input voltage		9/1	<1	10			3		3		3	
	Vollage		13.5/1.5	<1	15			4		4		4	
		0/5	2.5	<1	5	-0.8	-1.6		-0.65		-0.65		
١.	Output drive	0/5	4.6	<1	5	-0.2	-0.4		-0.18		-0.18		
I _{OH}	current	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		mA
		0/5	0.4	<1	5	3	4		2.4		2.4		
I _{OL}	Output sink current	0/10	0.5	<1	10	8	10		6.4		6.4		
Current	0/15	1.5	<1	15	24	36		19		19			
I _I	Input leakage current	0/18	Any in	out	18		±10 ⁻⁵	±0.1		±1		±1	μA
C _I	Input capacitance		Any in	out			5	7.5					pF

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

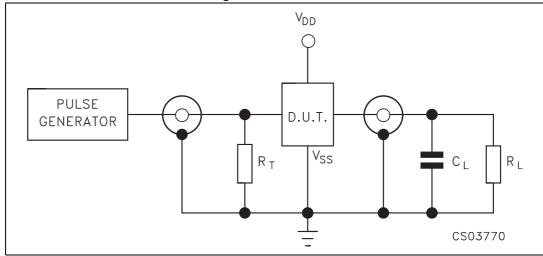


Table 7. Dynamic electrical characteristics (T_{amb} = 25 °C, C_L = 50 pF, R_L = 200 k Ω , t_r = t_f = 20 ns)

Symbol	Parameter	Те	st condition	n	Value ⁽¹⁾			Unit
Symbol	rarameter	V _{DD} (V)	V _I (V)	V _{CC} (V)	Min.	Тур.	Max.	Unit
		5	5	5		150	350	
t _{TLH}	Output transition time	10	10	10		75	15	
		15	15	15		55	110	
		5	5	5		35	70	
t _{THL}	Output transition time	10	10	10		20	40	
		15	15	15		15	30	
		5	5	5		100	200	
		10	10	10		50	100	no
t _{PLH}	Propagation delay time	10	10	5		50	100	ns
		15	15	15		35	70	
		15	15	5		35	70	
t _{PHL} Propaç		5	5	5		65	130	
		10	10	10		35	70	
	Propagation delay time	10	10	5		30	70	
		15	15	15		25	50	
		15	15	5		20	40	

1. Typical temperature coefficient for all $\rm V_{DD}$ values is 0.3%/°C.

Figure 3. Test circuit



- 1. $C_L = 50$ pF or equivalent (includes jig and probe capacitance).
- 2. R_L = 200 kΩ.
- 3. R_T = Z_{OUT} of pulse generator (typically 50 Ω).

Electrical characteristics HCF4010

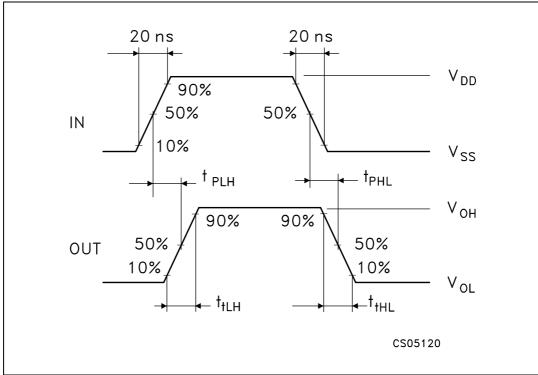


Figure 4. Waveform - propagation delay times (f = 1 MHz; 50% duty cycle)



HCF4010 Package information

4 Package information

In order to meet environmental requirements, ST offers these devices in different grades of ECOPACK® packages, depending on their level of environmental compliance. ECOPACK specifications, grade definitions and product status are available at: www.st.com. ECOPACK is an ST trademark.



Package information HCF4010

4.1 SO16 package information

D M S F

Figure 5. SO16 package outline

Table 8. SO16 package mechanical data

			Dimer	nsions			
Symbol		mm			inch		
	Min.	Тур.	Max.	Min.	Тур.	Max.	
Α			1.75			0.068	
a1	0.1		0.25	0.004		0.010	
a2			1.64			0.063	
b	0.35		0.46	0.013		0.018	
b1	0.19		0.25	0.007		0.010	
С		0.5			0.019		
c1			45° ((typ.)			
D	9.8		10	0.385		0.393	
E	5.8		6.2	0.228		0.244	
е		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	
М			0.62			0.024	
S		8° (max.)					

0016020D

HCF4010 Package information

Figure 6. SO16 tape and reel information

1. Drawing not in scale.

Table 9. SO16 tape and reel information

	Dimensions							
Symbol		mm			inch			
	Min.	Тур.	Max.	Min.	Тур.	Max.		
Α			330			12.992		
С	12.8		13.2	0.504		0.519		
D	20.2			0.795				
N	60			2.362				
Т			22.4			0.882		
Ao	6.45		6.65	0.254		0.262		
Во	10.3		10.5	0.406		0.414		
Ko	2.1		2.3	0.082		0.090		
Po	3.9		4.1	0.153	_	0.161		
Р	7.9		8.1	0.311		0.319		

Ordering information HCF4010

5 Ordering information

Table 10. Order codes

Order code	Temperature range	Package	Packing	Marking
HCF4010M013TR	–55 °C to +125 °C	SO16	Tape and	HCF4010
HCF4010YM013TR ⁽¹⁾	–40 °C to +125 °C	SO16 (automotive grade)	reel	HCF4010Y

Qualification and characterization according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q002 or equivalent.

6 Revision history

Table 11. Document revision history

Date	Revision	Changes
16-Mar-2005	3	Add V _{CC} on Table 6
11-Jun-2012	4	Added Applications on page 1 Updated Table 1: Device summary Removed DIP16 package from document Revised document presentation, minor textual updates
15-Jun-2012	5	Updated temperature range in <i>Table 1</i> Updated T _{op} in <i>Table 5</i>
19-Oct-2012	6	Updated Features (added ESD data). Updated Table 1 (added Marking, updated note 1.) Reformatted Section 4 (added Figure 5 and Figure 6, Table 8 and Table 9). Minor corrections throughout document.
25-Apr-2013	7	Updated Features: ESD data modified, removed information regarding B series CMOS devices. Added Section 5: Ordering information
13-Jan-2014	8	Table 1: Device summary: added "Packing"

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