

- ESD performance
  - HBM: 1 kV
  - MM: 200 V
  - CDM: 1 kV

### Applications

- Automotive
- Industrial
- Computer
- Consumer

### Features

- Medium-speed operation  
 $t_{PD} = 30 \text{ ns}$  (typ.) at 10 V
- Standardized symmetrical output characteristics
- Quiescent current specified up to 20 V
- 5 V, 10 V, and 15 V parametric ratings
- Input leakage current  $I_I = 100 \text{ nA}$  (max.) at  $V_{DD} = 18 \text{ V}$  and  $T_A = 25 \text{ }^\circ\text{C}$
- 100 % tested for quiescent current

### Description

The HCF4069U is a monolithic integrated circuit fabricated in metal oxide semiconductor technology available in the SO14 package. The HCF4069U consists of six COS/MOS inverter circuits. This device is intended for all general purpose inverter applications where the medium power TTL-drive and logic level conversion capabilities of circuits such as HCF4049 hex inverter/buffers are not required.

Table 1. Device summary table

Order code	Temperature range	Package	Packing	Marking
HCF4069UM013TR	-55 ° C to +125 ° C	SO14	Tape and reel	HCF4069U
HCF4069YUM013TR (1)	-40 ° C to +125 ° C	SO14 (automotive grade) <sup>(1)</sup>		HCF4069Y

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

# Contents

<b>1</b>	<b>Pin information</b> .....	<b>3</b>
<b>2</b>	<b>Functional description</b> .....	<b>4</b>
<b>3</b>	<b>Electrical characteristics</b> .....	<b>5</b>
<b>4</b>	<b>Package information</b> .....	<b>8</b>
	4.1 SO14 package information .....	9
<b>5</b>	<b>Ordering information</b> .....	<b>10</b>
<b>6</b>	<b>Revision history</b> .....	<b>10</b>

# 1 Pin information

Figure 1. Pin connections (top view)

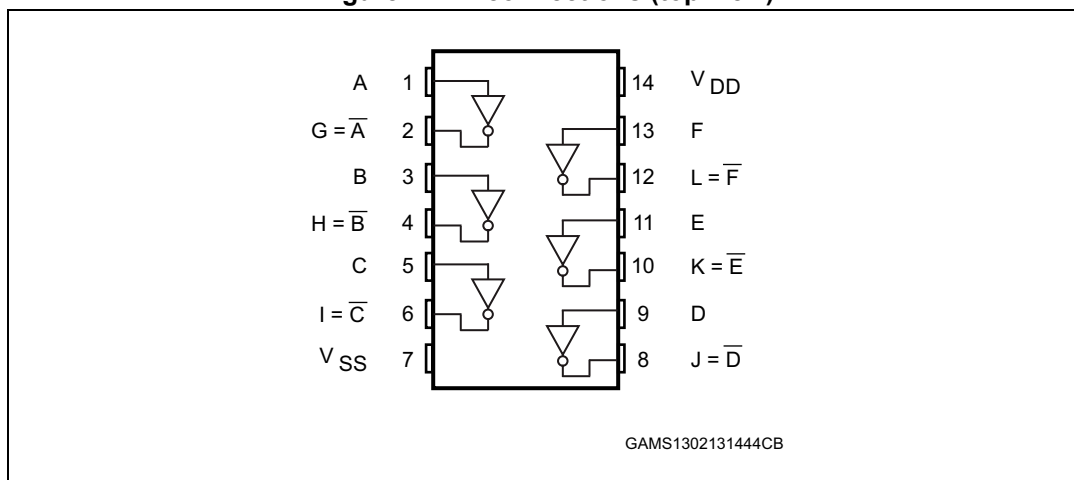


Table 2. Pin description

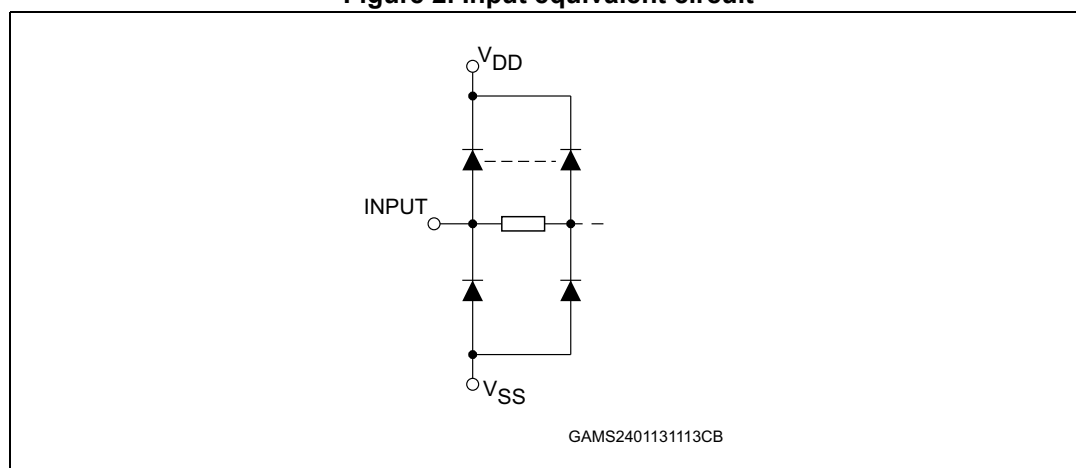
Pin no	Symbol	Name and function
1, 3, 5, 9, 11, 13	A, B, C, D, E, F	Data inputs
2, 4, 6, 8, 10, 12	G, H, I, J, K, L	Data outputs
7	V <sub>SS</sub>	Negative supply voltage
14	V <sub>DD</sub>	Positive supply voltage

## 2 Functional description

Table 3. Truth table

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

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  $V_{SS}$  pin voltage.

**Table 4. Absolute maximum ratings (AMR)**

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply voltage	-0.5 to +22	V
$V_I$	DC input voltage	-0.5 to $V_{DD} + 0.5$	
$I_I$	DC input current	$\pm 10$	mA
$P_D$	Power dissipation per package	200	mW
	Power dissipation per output transistor	100	
$T_{op}$	Operating temperature	-55 to +125	°C
$T_{stg}$	Storage temperature	-65 to +150	

**Table 5. Recommended operating conditions**

Symbol	Parameter	Value	Unit
$V_{DD}$	Supply voltage	3 to 20	V
$V_I$	Input voltage	0 to $V_{DD}$	
$T_{op}$	Operating temperature	-55 to 125	°C

Table 6. DC specifications<sup>(1)</sup>

Sym.	Parameter	Test condition				Value						Unit	
		V <sub>I</sub> (V)	V <sub>O</sub> (V)	I <sub>O</sub>   (μA)	V <sub>DD</sub> (V)	T <sub>A</sub> = 25 °C			-40 to 85 °C		-55 to 125 °C		
						Min.	Typ.	Max.	Min.	Max.	Min.		Max.
I <sub>L</sub>	Quiescent current	0/5			5			0.25		7.5		7.5	μA
		0/10			10		0.01	0.5		15		15	
		0/15			15			1		30		30	
		0/20			20		0.02	5		150		150	
V <sub>OH</sub>	High level output voltage	0/5		<1	5	4.95			4.95		4.95		V
		0/10			10	9.95			9.95		9.95		
		0/15			15	14.95			14.95		14.95		
V <sub>OL</sub>	Low level output voltage	5/0		<1	5		0.05			0.05		0.05	
		10/0			10								
		15/0			15								
V <sub>IH</sub>	High level input voltage		0.5/4.5	<1	5	4			4		4		
			1/9		10	8			8		8		
			1.5/13.5		15	12.5			12.5		12.5		
V <sub>IL</sub>	Low level input voltage		4.5/0.5	<1	5			1		1		1	
			9/1		10			2		2		2	
			13.5/1.5		15			2.5		2.5		2.5	
I <sub>OH</sub>	Output drive current	0/5	2.5	<1	5	-1.36	-3.2		-1.15		-1.1		
			4.6			-0.44	-1		-0.36		-0.36		
		0/10	9.5		10	-1.1	-2.6		-0.9		-0.9		
		0/15	13.5		15	-3.0	-6.8		-2.4		-2.4		
I <sub>OL</sub>	Output sink current	0/5	0.4	<1	5	0.44	1		0.36		0.36	mA	
		0/10	0.5		10	1.1	2.6		0.9		0.9		
		0/15	1.5		15	3.0	6.8		2.4		2.4		
I <sub>I</sub>	Input leakage current	0/18	Any input	18		±10 <sup>-5</sup>	±0.1		±1		±1	μA	
C <sub>I</sub>	Input capacitance		Any input			5	7.5					pF	

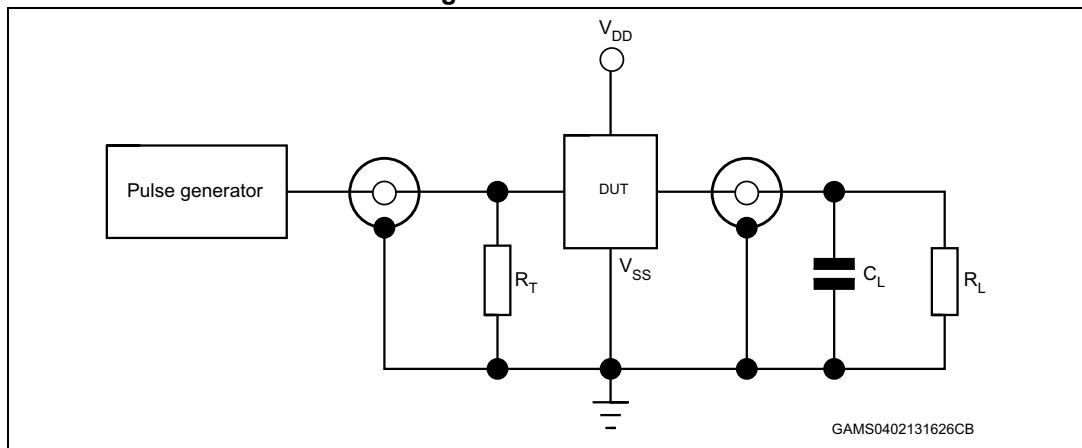
1. The noise margin for both level "1" and "0" is: 1 V min. with V<sub>DD</sub> = 5 V, 2 V min. with V<sub>DD</sub> = 10 V, and 2.5 V min. with V<sub>DD</sub> = 15 V.

**Table 7. Dynamic electrical characteristics**  
 ( $T_{amb} = 25\text{ }^{\circ}\text{C}$ ,  $C_L = 50\text{ pF}$ ,  $R_L = 200\text{ k}\Omega$ ,  $t_r = t_f = 20\text{ ns}$ )

Symbol	Parameter	Test condition	Value <sup>(1)</sup>		Unit
		$V_{DD}$ (V)	Typ.	Max.	
$t_{PLH}$ , $t_{PHL}$	Propagation delay time	5	55	110	ns
		10	30	60	
		15	25	50	
$t_{TLH}$ , $t_{THL}$	Output transition time	5	100	200	
		10	50	100	
		15	40	80	

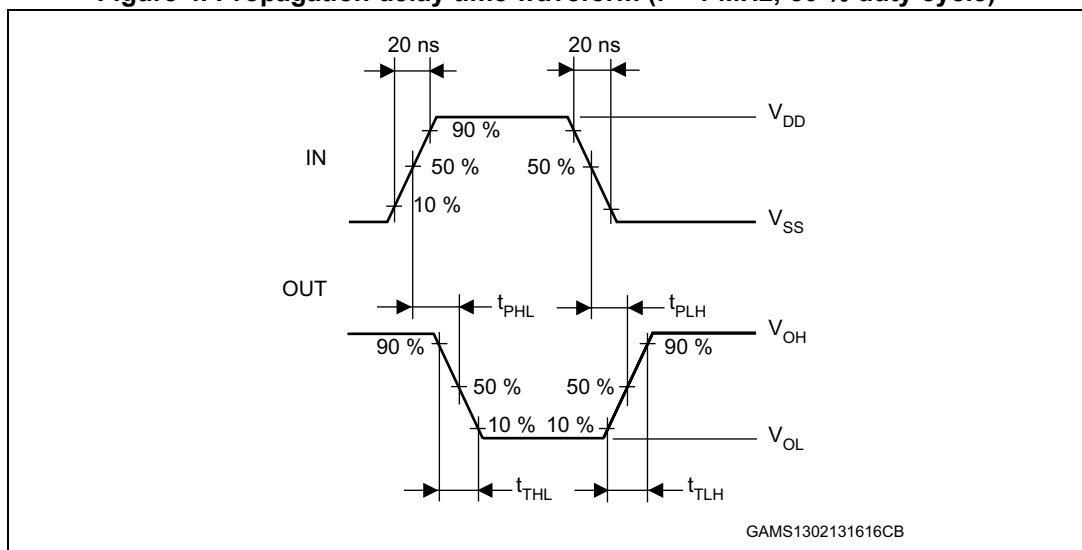
1. The typical temperature coefficient for all  $V_{DD}$  values is 0.3 %/°C.

**Figure 3. Test circuit**



1. Legend:  $C_L = 50\text{ pF}$  or equivalent (includes jig and probe capacitance),  $R_L = 200\text{ k}\Omega$ ,  $R_T = Z_{OUT}$  of pulse generator (typically  $50\text{ }\Omega$ )

**Figure 4. Propagation delay time waveform (f = 1 MHz; 50 % duty cycle)**



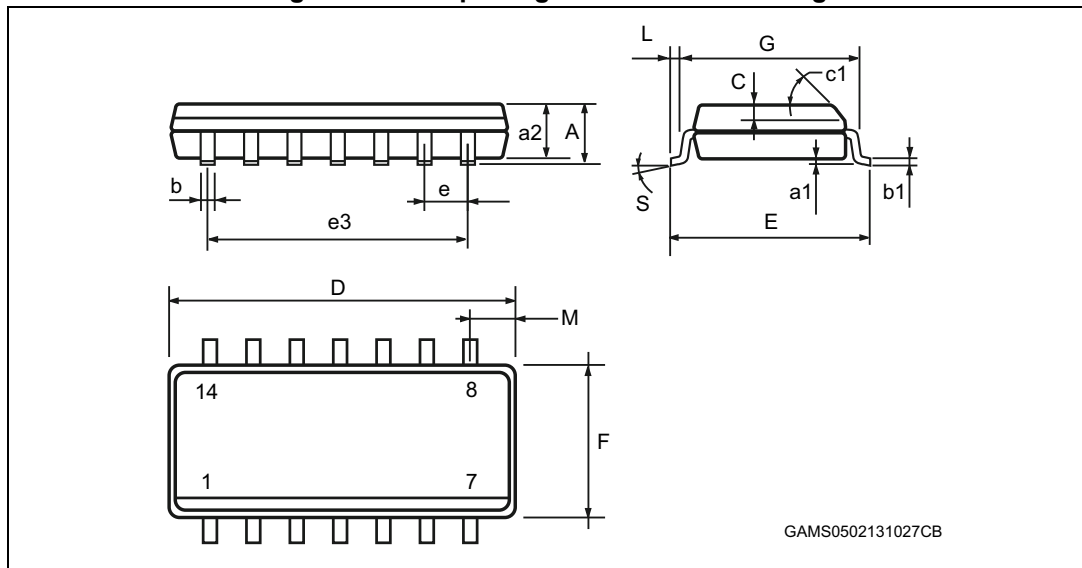
## 4 Package information

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



### 4.1 SO14 package information

Figure 5. SO14 package mechanical drawing



GAMS0502131027CB

Table 8. SO14 package mechanical data

Ref	Dimensions					
	Millimeters			Inches		
	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 °			45 °	
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 °			8 °

## 5 Ordering information

**Table 9. Order codes**

Order code	Temp. range	Package	Packing	Marking
HCF4069UM013TR	-55 ° C to +125 ° C	SO14	Tape and reel	HCF4069U
HCF4069YUM013TR (1)	-40 ° C to +125 ° C	SO14 (automotive grade) <sup>(1)</sup>		HCF4069Y

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

## 6 Revision history

**Table 10. Document revision history**

Date	Revision	Changes
18-Feb-2013	4	Document template and layout updated Removed "B" from part number. Updated package names (PDIP-14 and SO14 instead of DIP-14 and SOP-14). Added <a href="#">Applications</a> . Added <a href="#">Device summary table</a> . Added <a href="#">Section 5: Ordering information</a> .
22-Mar-2013	5	Updated <a href="#">Table 1: Device summary table</a> and <a href="#">Table 9: Order codes</a> .
10-Jan-2014	6	Removed PDIP-14 package Added ESD data to <a href="#">Features</a> <a href="#">Table 1: Device summary table</a> : updated footnote 1. <a href="#">Table 9: Order codes</a> : updated footnote 1.

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