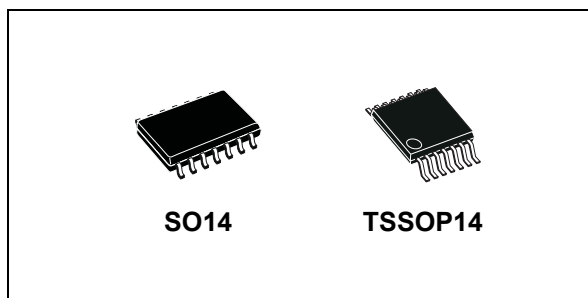


## Quad 2-input Schmitt NAND gate

Datasheet - production data



- Wide operating voltage range:  
 $V_{CC}$  (opr) = 2 V to 6 V
- Pin and function compatible with 74 series 132
- ESD performance
  - HBM: 2 kV
  - MM: 200 V
  - CDM: 1 kV

### Description

The M74HC132 is a high-speed CMOS quad 2-input Schmitt NAND gate fabricated with silicon gate C<sup>2</sup>MOS technology.

Pin configuration and function are identical to those of the M74HC00. The hysteresis characteristics (around 20 %  $V_{CC}$ ) of all inputs allow slowly changing input signals to be transformed into sharply defined jitter-free output signals.

All inputs are equipped with protection circuits against static discharge and transient excess voltage.

### Features

- High-speed:  
 $t_{PD}$  = 11 ns (typ.) at  $V_{CC}$  = 6 V
- Low power dissipation:  
 $I_{CC}$  = 1  $\mu$ A (max.) at  $T_A$  = 25 °C
- High noise immunity:  
 $V_H$ (typ) = 0.9 V at  $V_{CC}$  = 5 V
- Symmetrical output impedance:  
 $I_{OH}$  =  $I_{OL}$  = 4 mA (min.)
- Balanced propagation delays:  
 $t_{PLH} \cong t_{PHL}$

Table 1. Device summary

Order code	Temp. range	Package	Packing	Marking
M74HC132RM13TR	-55 °C to 125 °C	S014	Tape and reel	74HC132
M74HC132YRM13TR <sup>(1)</sup>	-40 °C to 125 °C	SO14 (automotive grade)		74HC132Y
M74HC132TTR	-55 °C to 125 °C	TSSOP14		HC132
M74HC132YTTR <sup>(1)</sup>	-40 °C to 125 °C	TSSOP14 (automotive grade)		HC132Y

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

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# 1 Pin information

Figure 1. Pin connection and IED logic symbols

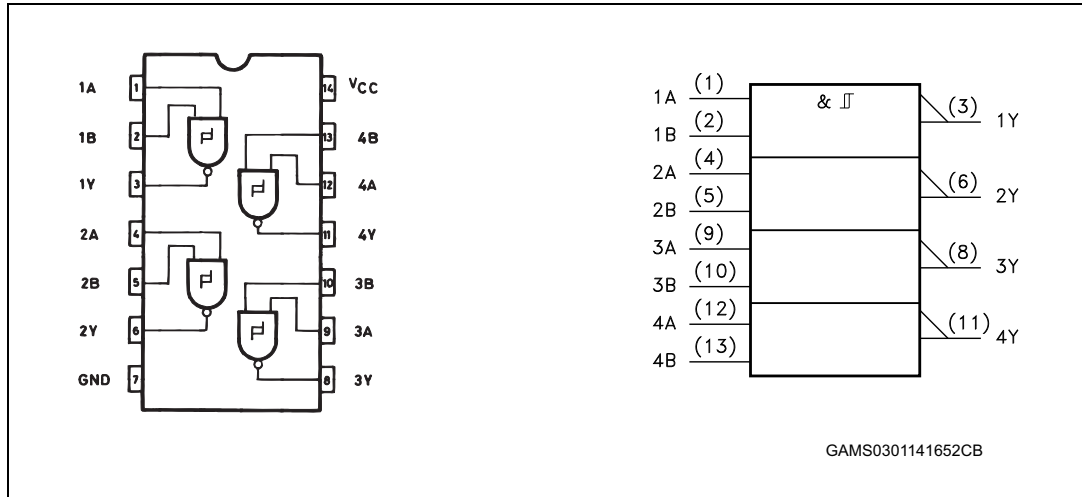


Table 2. Pin description

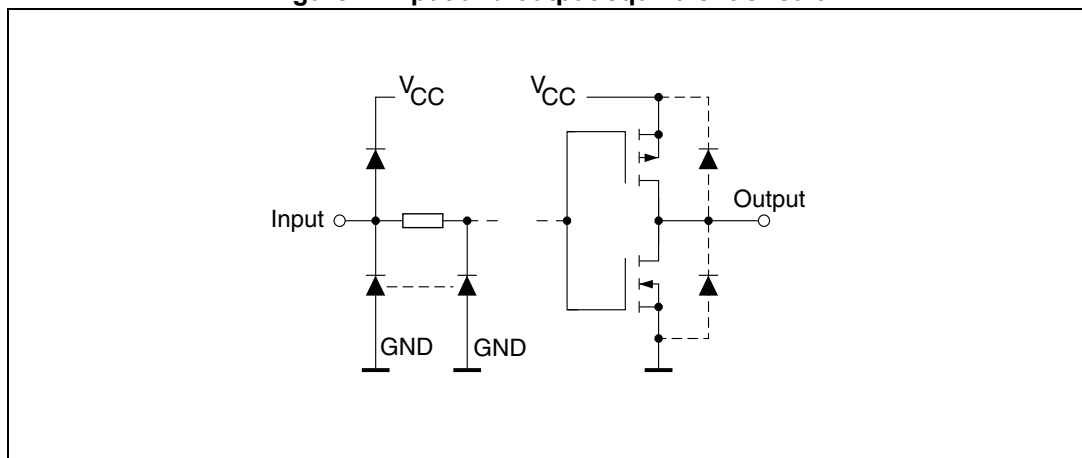
Pin no	Symbol	Name and function
1, 4, 9, 12	1A to 4A	Data inputs
2, 5, 10, 13	1B to 4B	
3, 6, 8, 11	1Y to 4Y	Data outputs
7	GND	Ground (0 V)
14	V <sub>CC</sub>	Positive supply voltage

## 2 Functional description

Table 3. Truth table

A	B	Y
L	L	H
L	H	H
H	L	H
H	H	L

Figure 2. Input and output 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.

**Table 4. Absolute maximum ratings**

Symbol	Parameter		Value	Unit
$V_{CC}$	Supply voltage		-0.5 to +7	V
$V_I$	DC input voltage		-0.5 to $V_{CC} + 0.5$	
$V_O$	DC output voltage			
$I_{IK}$	DC input diode current		$\pm 20$	mA
$I_{OK}$	DC output diode current			
$I_O$	DC output current		$\pm 25$	
$I_{CC}$ or $I_{GND}$	DC $V_{CC}$ or ground current		$\pm 50$	
$P_D$	Power dissipation	SO14	500 <sup>(1)</sup>	mW
		TSSOP14	450 <sup>(1)</sup>	
$T_{stg}$	Storage temperature		-65 to +150	°C
$T_L$	Lead temperature (10 sec)		300	

1. Power dissipation at 65 °C. Derating from 65 °C to 125 °C: SO14 -7 mW/°C, TSSOP14 -6.1 mW/°C.

**Table 5. Recommended operating conditions**

Symbol	Parameter		Value	Unit
$V_{CC}$	Supply voltage		2 to 6	V
$V_I$	Input voltage		0 to $V_{CC}$	
$V_O$	Output voltage			
$T_{op}$	Operating temperature		-55 to 125	°C

Table 6. DC specifications

Symbol	Parameter	Test condition		Value						Unit	
		V <sub>CC</sub> (V)		T <sub>A</sub> = 25 °C			-40 to 85 °C		-55 to 125 °C		
				Min.	Typ.	Max.	Min.	Max.	Min.		Max.
V <sub>P</sub>	High level threshold voltage	2.0		1.0	1.25	1.5	1.0	1.5	1.0	1.5	V
		4.5		2.3	2.7	3.15	2.3	3.15	2.3	3.15	
		6.0		3.0	3.5	4.2	3.0	4.2	3.0	4.2	
V <sub>N</sub>	Low level threshold voltage	2.0		0.3	0.65	0.9	0.3	0.9	0.3	0.9	V
		4.5		1.13	1.6	2.0	1.13	2.0	1.13	2.0	
		6.0		1.5	2.3	2.6	1.5	2.6	1.5	2.6	
V <sub>H</sub>	Hysteresis voltage	2.0		0.3	0.6	1.0	0.3	1.0	0.3	1.0	V
		4.5		0.6	1.1	1.4	0.6	1.4	0.6	1.4	
		6.0		0.8	1.2	1.4	0.8	1.7	0.8	1.7	
V <sub>OH</sub>	High level output voltage	2.0	I <sub>O</sub> = -20 μA	1.9	2.0		1.9		1.9		V
		4.5	I <sub>O</sub> = -20 μA	4.4	4.5		4.4		4.4		
		6.0	I <sub>O</sub> = -20 μA	5.9	6.0		5.9		5.9		
		4.5	I <sub>O</sub> = -4.0 mA	4.18	4.31		4.13		4.10		
		6.0	I <sub>O</sub> = -5.2 mA	5.68	5.8		5.63		5.60		
V <sub>OL</sub>	Low level output voltage	2.0	I <sub>O</sub> = -20 μA			0.1		0.1		0.1	V
		4.5	I <sub>O</sub> = -20 μA			0.1		0.1		0.1	
		6.0	I <sub>O</sub> = -20 μA			0.1		0.1		0.1	
		4.5	I <sub>O</sub> = -4.0 mA		0.17	0.26		0.33		0.40	
		6.0	I <sub>O</sub> = -5.2 mA		0.18	0.26		0.33		0.40	
I <sub>I</sub>	Input leakage current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			±0.1		±1		±1	μA
I <sub>CC</sub>	Quiescent supply current	6.0	V <sub>I</sub> = V <sub>CC</sub> or GND			1		10		20	μA

**Table 7. AC electrical characteristics**  
( $C_L = 50 \text{ pF}$ , Input  $t_r = t_f = 6 \text{ ns}$ )

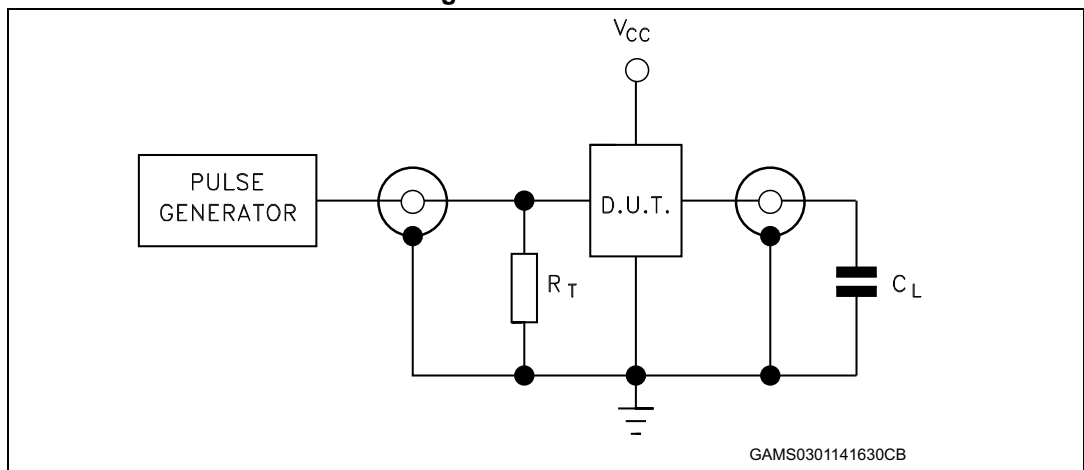
Symbol	Parameter	Test condition	Value						Unit	
		$V_{CC}$ (V)	$T_A = 25 \text{ }^\circ\text{C}$			$-40 \text{ to } 85 \text{ }^\circ\text{C}$		$-55 \text{ to } 125 \text{ }^\circ\text{C}$		
			Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$t_{TLH}, t_{THL}$	Output transition time	2.0	-	30	75	-	95	-	110	ns
		4.5	-	8	15	-	19	-	22	
		6.0	-	7	13	-	16	-	19	
$t_{PLH}, t_{PHL}$	Propagation delay time	2.0	-	52	105	-	130	-	160	ns
		4.5	-	13	21	-	26	-	32	
		6.0	-	11	18	-	22	-	27	

**Table 8. Capacitive characteristics**

Sym	Parameter	Test condition	Value						Unit	
		$V_{CC}$ (V)	$T_A = 25 \text{ }^\circ\text{C}$			$-40 \text{ to } 85 \text{ }^\circ\text{C}$		$-55 \text{ to } 125 \text{ }^\circ\text{C}$		
			Min	Typ	Max	Min	Max	Min		Max
$C_{IN}$	Input capacitance	5.0	-	5	10	-	10	-	10	pF
$C_{PD}$	Power dissipation capacitance <sup>(1)</sup>		-	29	-	-	-	-		

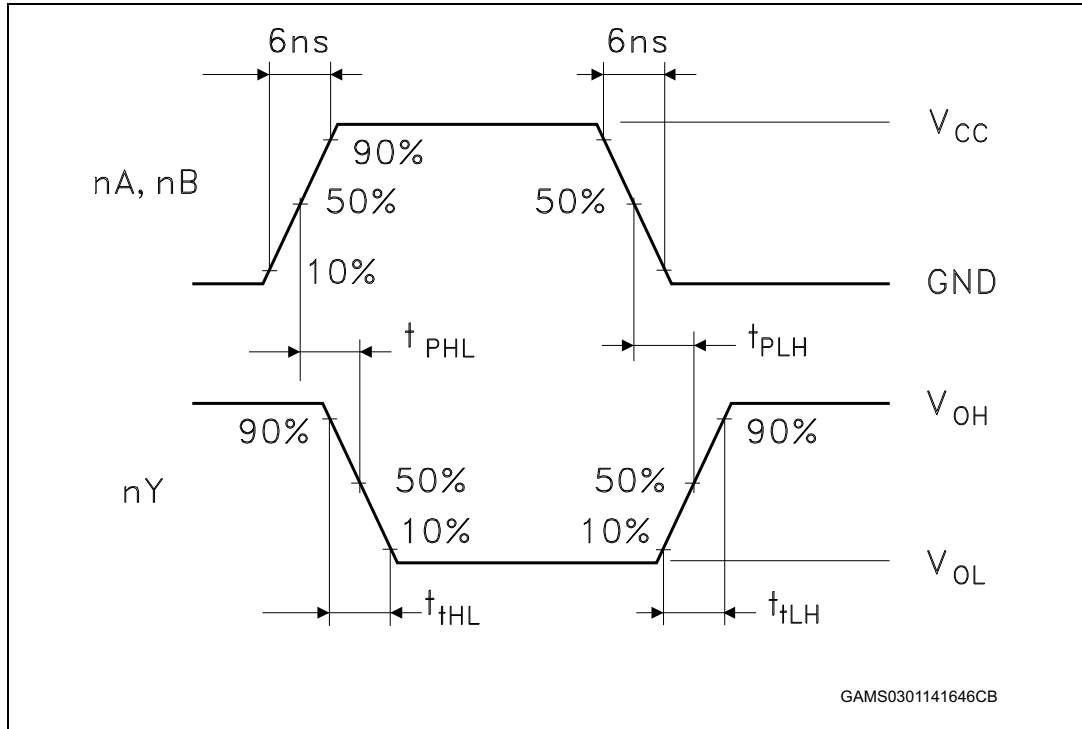
1.  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load (refer to test circuit). Average operating current can be obtained by the following equation:  
 $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/4$  (per gate).

**Figure 3. Test circuit**



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

Figure 4. Propagation delay times  
(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

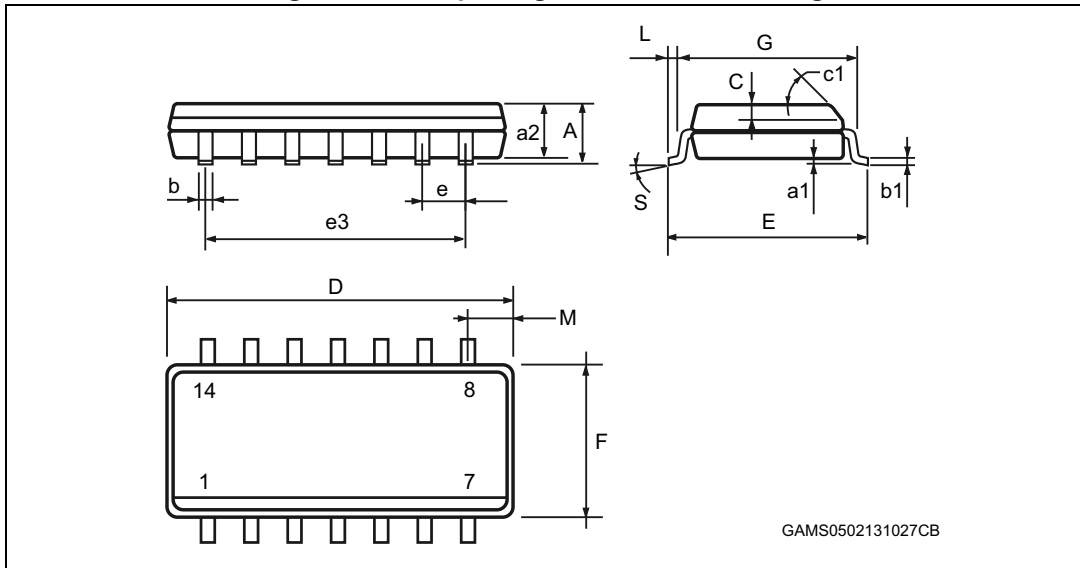


Table 9. SO14 package mechanical data

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 °

## 4.2 TSSOP14 package information

Figure 6. TSSOP14 package mechanical drawing

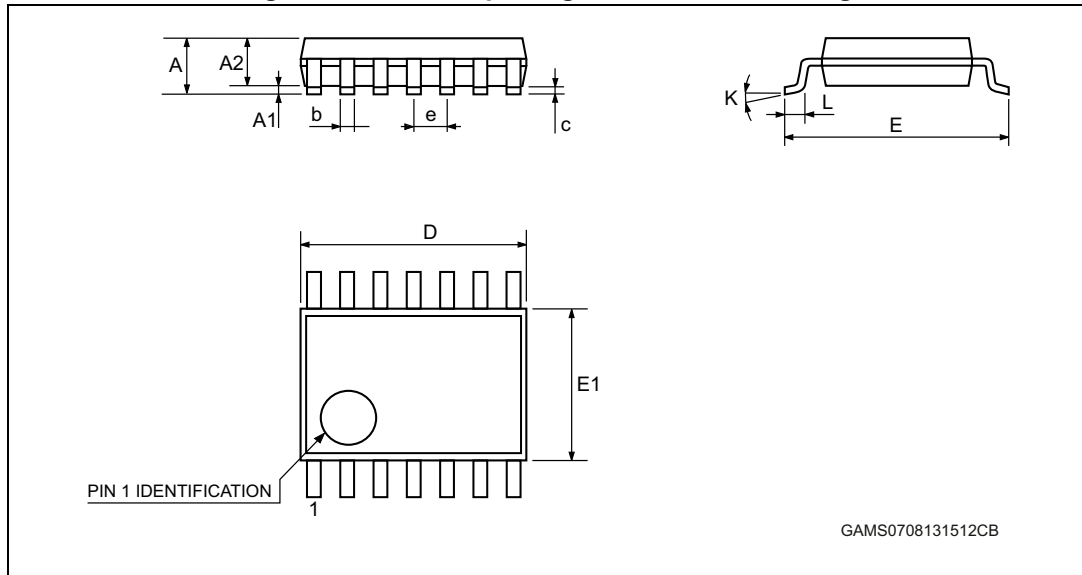


Table 10. TSSOP14 package mechanical data

Ref	Dimensions					
	Millimeters			Inches		
	Min.	Typ.	Max.	Min.	Typ.	Max.
A			1.2			0.047
A1	0.05		0.15	0.002	0.004	0.006
A2	0.8	1	1.05	0.031	0.039	0.041
b	0.19		0.30	0.007		0.012
c	0.09		0.20	0.004		0.0089
D	4.9	5	5.1	0.193	0.197	0.201
E	6.2	6.4	6.6	0.244	0.252	0.260
E1	4.3	4.4	4.48	0.169	0.173	0.176
e		0.65			0.0256	
K	0 °		8 °	0 °		8 °
L	0.45	0.60	0.75	0.018	0.024	0.030

## 5 Ordering information

Table 11. Order codes

Order code	Temp. range	Package	Packing	Marking
M74HC132RM13TR	-55 °C to 125 °C	S014	Tape and reel	74HC132
M74HC132YRM13TR <sup>(1)</sup>	-40 °C to 125 °C	SO14 (automotive grade)		74HC132Y
M74HC132TTR	-55 °C to 125 °C	TSSOP14		HC132
M74HC132YTTR <sup>(1)</sup>	-40 °C to 125 °C	TSSOP14 (automotive grade)		HC132Y

1. 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 12. Document revision history

Date	Revision	Changes
10-Jan-2014	3	Removed DIP14 package Added ESD data to <a href="#">Features</a> <a href="#">Table 1: Device summary</a> : added automotive grade order codes, added temperature range and marking details. Added <a href="#">Section 5: Ordering information</a> .

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