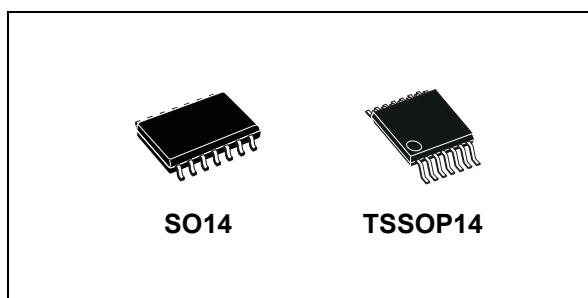


## 9-bit parity generator

Datasheet - production data



- Pin and function compatible with 74 series 280
- ESD performance
  - HBM: 2 kV
  - MM: 200 V
  - CDM: 1 kV

### Description

The M74HC280 is a high-speed CMOS 9-bit parity generator fabricated with silicon gate C<sup>2</sup>MOS technology.

It is composed of nine data inputs (A to I) and odd/even parity outputs ( $\Sigma$ ODD and  $\Sigma$ EVEN). The nine data inputs control the output conditions. When the number of high-level inputs is odd,  $\Sigma$ ODD outputs are kept high and  $\Sigma$ EVEN outputs are kept low. Conversely, when the number of high-level outputs is even,  $\Sigma$ EVEN outputs are kept high and  $\Sigma$ ODD outputs are kept low. The IC generates either odd or even parity making the application flexible. The word-length capability is easily expanded by cascading.

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

### Features

- High-speed:  
 $t_{PD} = 22 \text{ ns (typ.) at } V_{CC} = 6 \text{ V}$
- Low power dissipation:  
 $I_{CC} = 4 \mu\text{A (max.) at } T_A = 25 \text{ }^\circ\text{C}$
- High noise immunity:  
 $V_{NIH} = V_{NHL} = 28 \% V_{CC} \text{ (min)}$
- Symmetrical output impedance:  
 $|I_{OH}| = I_{OL} = 4 \text{ mA (min.)}$
- Balanced propagation delays:  
 $t_{PLH} \cong t_{PHL}$
- Wide operating voltage range:  
 $V_{CC} \text{ (opr)} = 2 \text{ V to } 6 \text{ V}$

**Table 1. Device summary**

Order code	Temp. range	Package	Packing	Marking
M74HC280RM13TR	-55 °C to 125 °C	S014	Tape and reel	74HC280
M74HC280YRM13TR <sup>(1)</sup>	-40 °C to 125 °C	SO14 (automotive grade)		74HC280Y
M74HC280TTR	-55 °C to 125 °C	TSSOP14		HC280
M74HC280YTTR <sup>(1)</sup>	-40 °C to 125 °C	TSSOP14 (automotive grade)		HC280Y

1. Qualification and characterization according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and 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>6</b>
<b>4</b>	<b>Package information</b> .....	<b>10</b>
	4.1 SO14 package information .....	11
	4.2 TSSOP14 package information .....	12
<b>5</b>	<b>Ordering information</b> .....	<b>13</b>
<b>6</b>	<b>Revision history</b> .....	<b>13</b>

# 1 Pin information

Figure 1. Pin connection and IED logic symbols

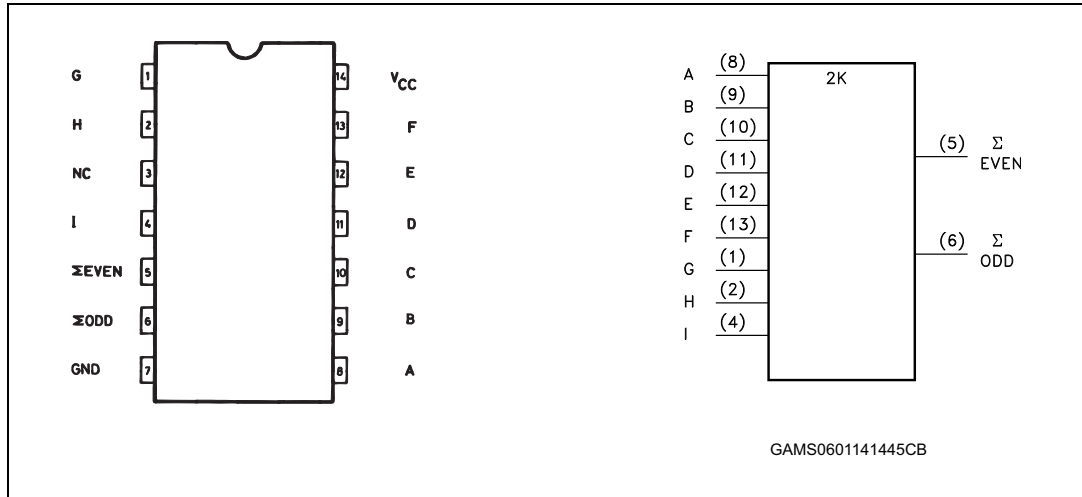


Table 2. Pin description

Pin no	Symbol	Name and function
5, 6	$\Sigma$ EVEN, $\Sigma$ ODD	Parity outputs
8, 9, 10, 11, 12, 13, 1, 2, 4	A to I	Data inputs
3	NC	No connection
7	GND	Ground (0 V)
14	$V_{CC}$	Positive supply voltage

## 2 Functional description

Figure 2. Logic diagram

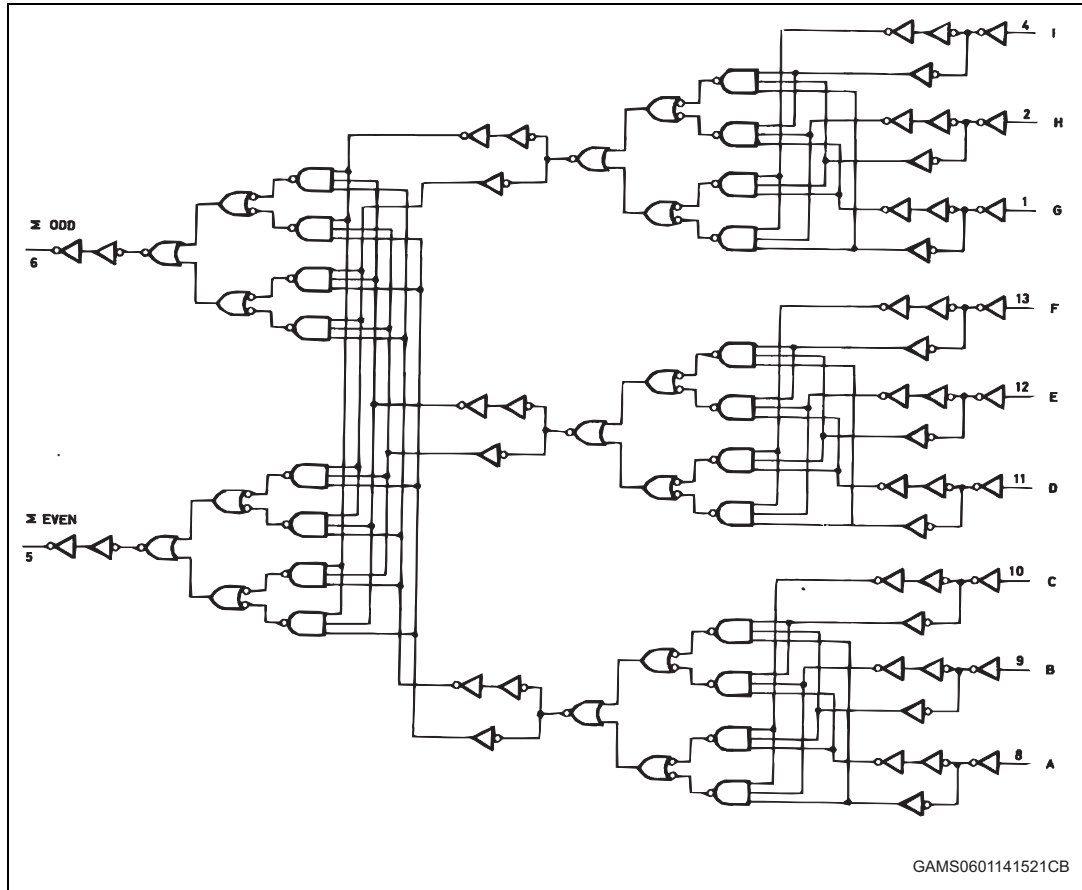
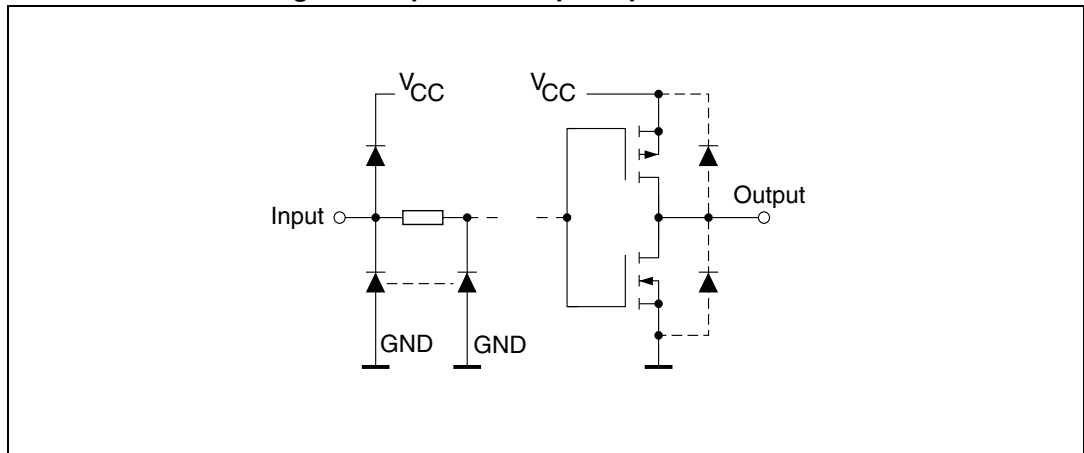


Table 3. Truth table

Number of inputs A - I that are high	Outputs	
	ΣEVEN	ΣODD
0, 2, 4, 6, 8	H	L
1, 3, 5, 7, 9	L	H

Figure 3. 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	500 <sup>(1)</sup>	mW
$T_{stg}$	Storage temperature	-65 to +150	°C
$T_L$	Lead temperature (10 sec)	300	

1. 500 mW at 65 °C; derate to 300 mW by 10 mW/°C from 65 °C to 85 °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	
$t_p, t_f$	Input rise and fall time	$V_{CC} = 2.0\text{ V}$	0 to 1000	ns
		$V_{CC} = 4.5\text{ V}$	0 to 500	
		$V_{CC} = 6.0\text{ V}$	0 to 400	

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>IH</sub>	High level input voltage	2.0		1.5			1.5		1.5		V
		4.5		3.15			3.15		3.15		
		6.0		4.2			4.2		4.2		
V <sub>IL</sub>	Low level input voltage	2.0				0.5		0.5		0.5	V
		4.5				1.35		1.35		1.35	
		6.0				1.8		1.8		1.8	
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			4		40		80	μA

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

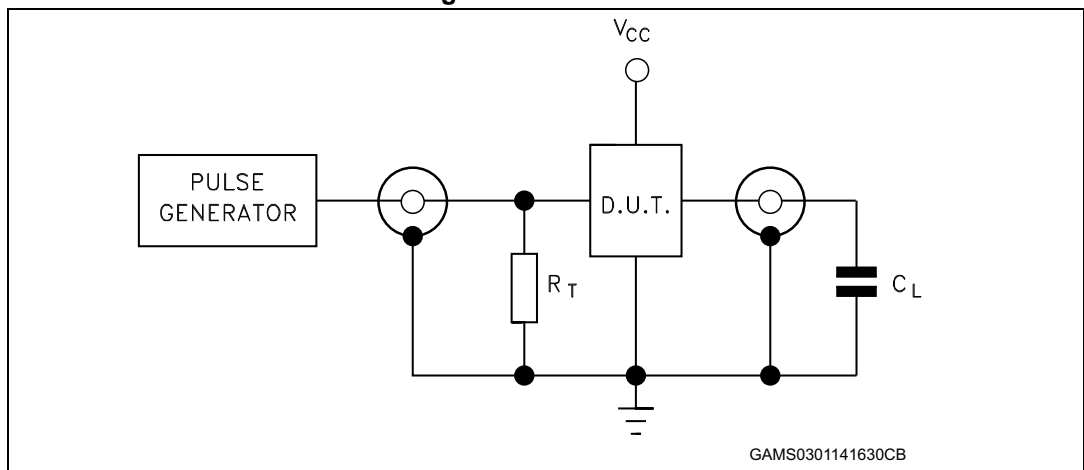
Symbol	Parameter	Test condition	Value						Unit	
		$V_{CC}$ (V)	$T_A = 25 \text{ }^\circ\text{C}$			$-40 \text{ to } 85 \text{ }^\circ\text{C}$		$-55 \text{ to } 125 \text{ }^\circ\text{C}$		
			Min.	Typ.	Max.	Min.	Max.	Min.		Max.
$t_{TLH}, t_{THL}$	Output transition time	2.0	-	30	75	-	95	-	110	ns
		4.5	-	8	15	-	19	-	22	
		6.0	-	7	13	-	16	-	19	
$t_{PLH}, t_{PHL}$	Propagation delay time (input to $\Sigma\text{EVEN}, \Sigma\text{ODD}$ )	2.0	-	80	200	-	250	-	290	ns
		4.5	-	26	40	-	50	-	58	
		6.0	-	22	34	-	43	-	49	

**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>		-	61	-	-	-	-		

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:  
 $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$ .

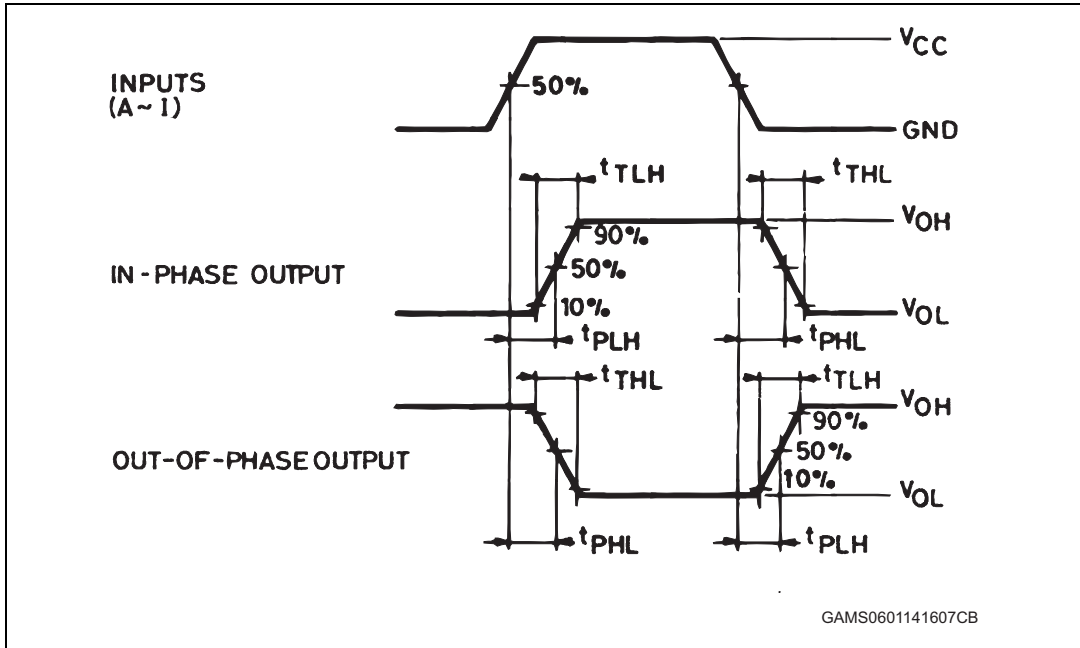
**Figure 4. Test circuit**



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 5. Propagation delay time  
(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 6. SO14 package mechanical drawing

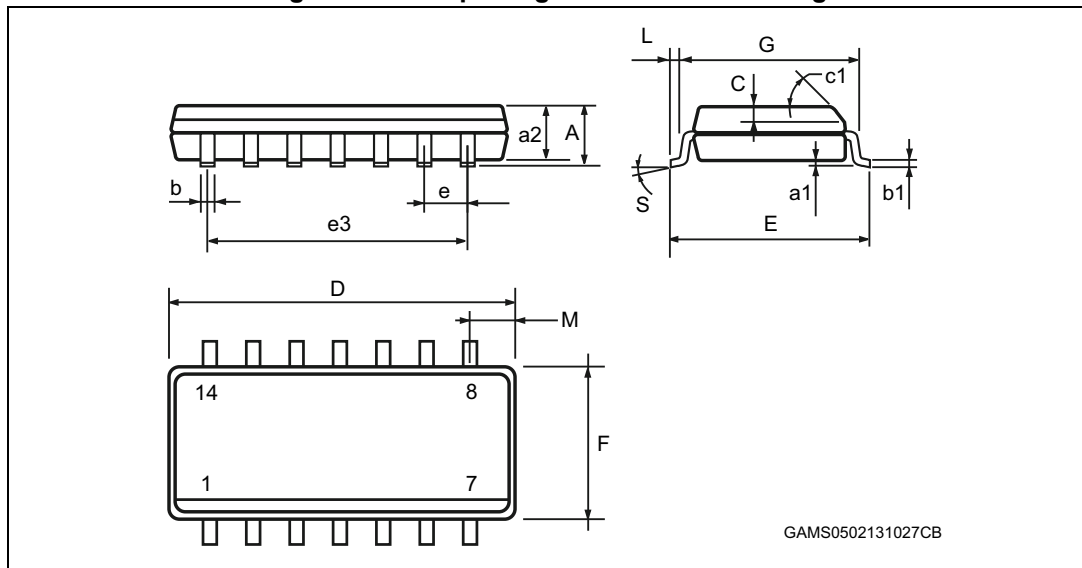


Table 9. SO14 package mechanical data

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 7. TSSOP14 package mechanical drawing

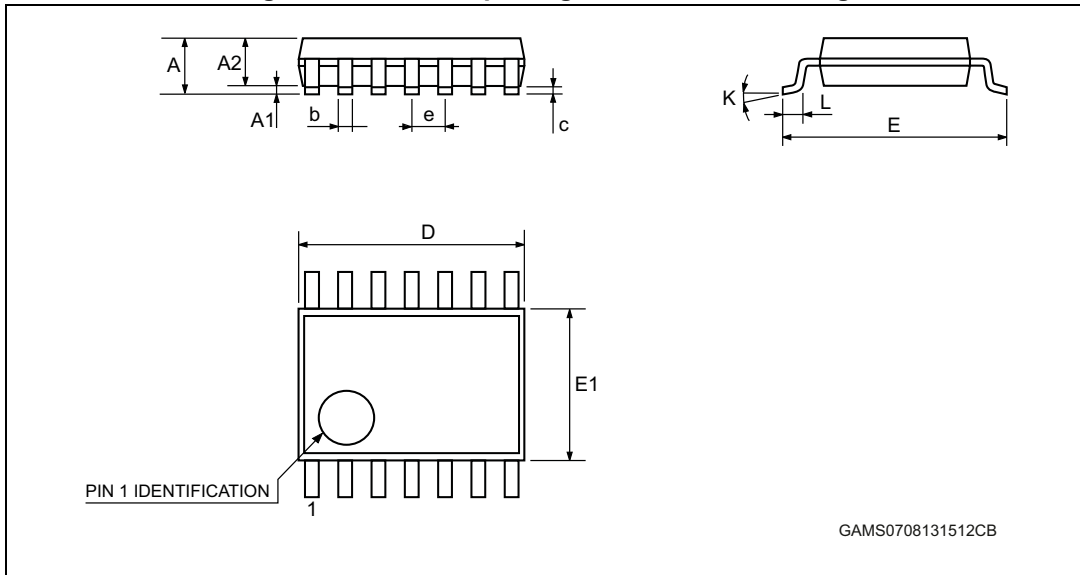


Table 10. TSSOP14 package mechanical data

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
M74HC280RM13TR	-55 °C to 125 °C	S014	Tape and reel	74HC280
M74HC280YRM13TR <sup>(1)</sup>	-40 °C to 125 °C	SO14 (automotive grade)		74HC280Y
M74HC280TTR	-55 °C to 125 °C	TSSOP14		HC280
M74HC280YTTR <sup>(1)</sup>	-40 °C to 125 °C	TSSOP14 (automotive grade)		HC280Y

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
15-Jan-2014	2	Removed DIP14 package Added ESD data <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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