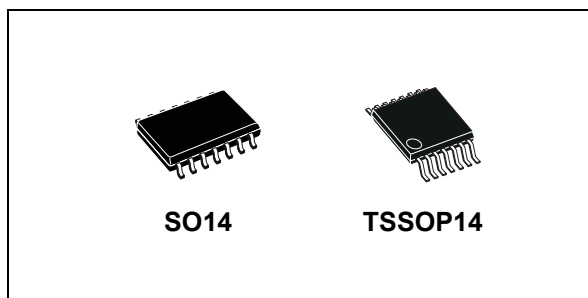


## 9-bit parity generator

Datasheet - production data



### 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:  
 $V_{CC} \text{ (opr)} = 2 \text{ V to } 6 \text{ V}$

- 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 ( $\Sigma\text{ODD}$  and  $\Sigma\text{EVEN}$ ). The nine data inputs control the output conditions. When the number of high-level inputs is odd,  $\Sigma\text{ODD}$  outputs are kept high and  $\Sigma\text{EVEN}$  outputs are kept low. Conversely, when the number of high-level outputs is even,  $\Sigma\text{EVEN}$  outputs are kept high and  $\Sigma\text{ODD}$  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.

Table 1. Device summary

| Order code                     | Temp. range      | Package                    | Packing       | Marking  |
|--------------------------------|------------------|----------------------------|---------------|----------|
| M74HC280RM13TR                 | -55 °C to 125 °C | SO14                       | 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

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1Pin information

Figure 1. Pin connection and IED logic symbols

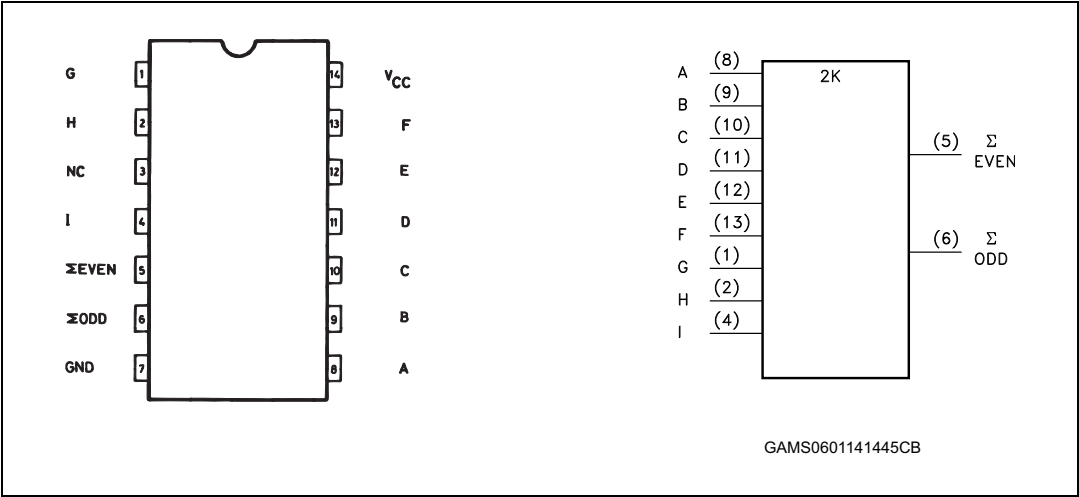


Table 2. Pin description

| 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

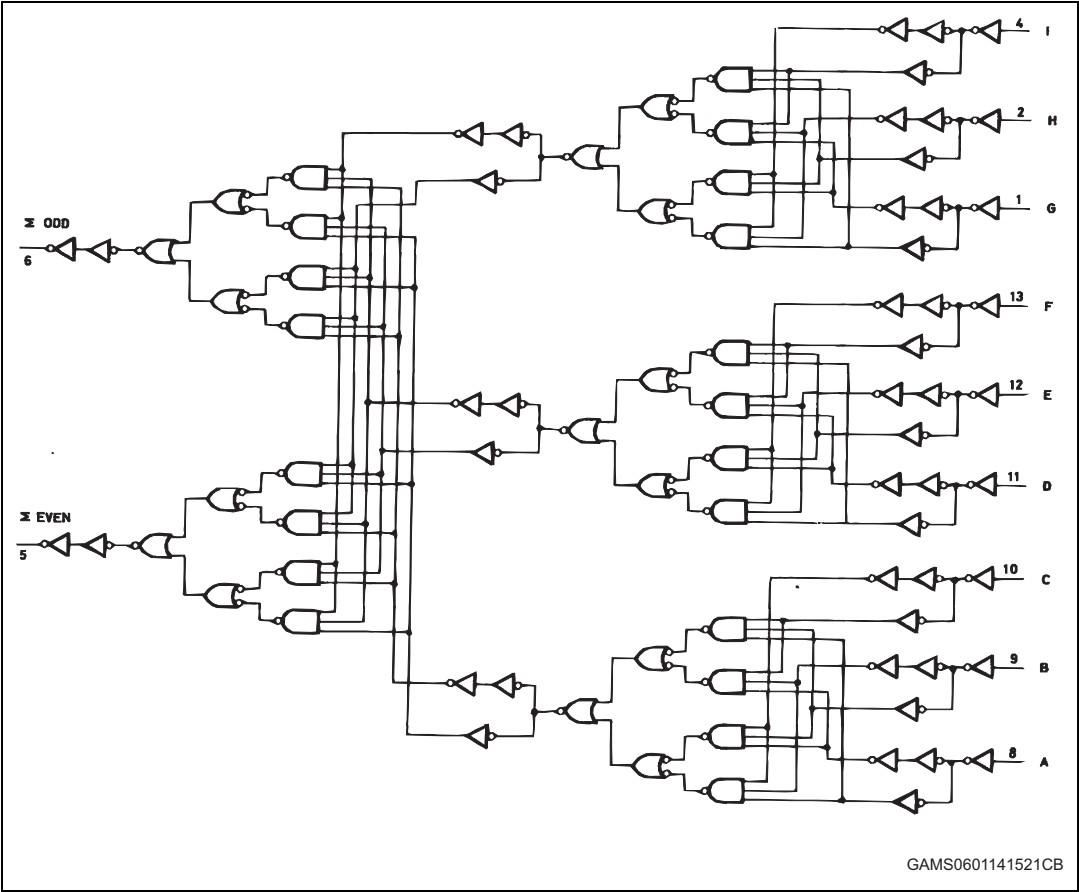
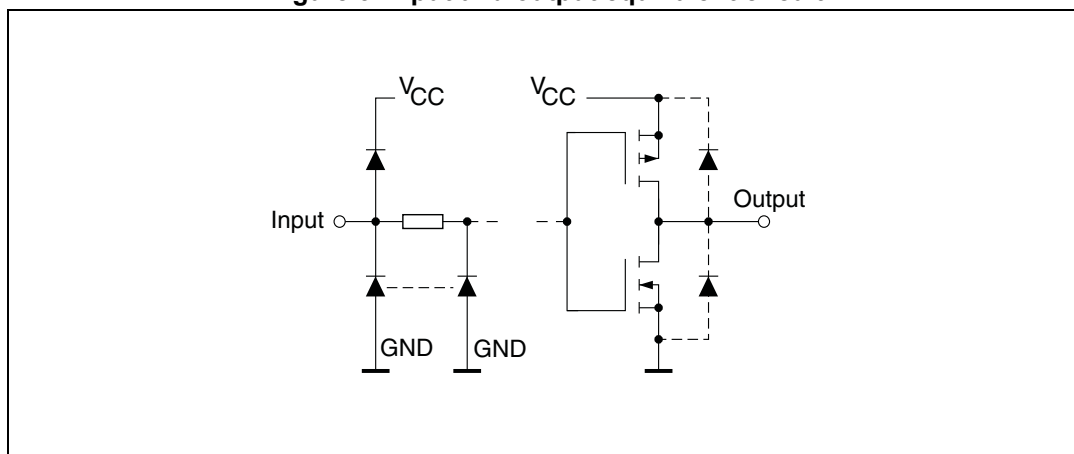


Table 3. Truth table

| 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 <sub>CC</sub>                     | Supply voltage                       | -0.5 to +7                    | V    |
| V <sub>I</sub>                      | DC input voltage                     | -0.5 to V <sub>CC</sub> + 0.5 |      |
| V <sub>O</sub>                      | DC output voltage                    |                               |      |
| I <sub>IK</sub>                     | DC input diode current               | ±20                           | mA   |
| I <sub>OK</sub>                     | DC output diode current              |                               |      |
| I <sub>O</sub>                      | DC output current                    | ±25                           |      |
| I <sub>CC</sub> or I <sub>GND</sub> | DC V <sub>CC</sub> or ground current | ±50                           |      |
| P <sub>D</sub>                      | Power dissipation                    | 500 <sup>(1)</sup>            | mW   |
| T <sub>stg</sub>                    | Storage temperature                  | -65 to +150                   | °C   |
| T <sub>L</sub>                      | 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 <sub>CC</sub>                 | Supply voltage           |                         | 2 to 6               | V    |
| V <sub>I</sub>                  | Input voltage            |                         | 0 to V <sub>CC</sub> |      |
| V <sub>O</sub>                  | Output voltage           |                         |                      |      |
| T <sub>op</sub>                 | Operating temperature    |                         | -55 to 125           | °C   |
| t <sub>p</sub> , t <sub>f</sub> | Input rise and fall time | V <sub>CC</sub> = 2.0 V | 0 to 1000            | ns   |
|                                 |                          | V <sub>CC</sub> = 4.5 V | 0 to 500             |      |
|                                 |                          | V <sub>CC</sub> = 6.0 V | 0 to 400             |      |

Table 6. DC specifications

| Symbol          | Parameter                 | Test condition         |                                         | Value                  |      |      |              |      |               |      |    | Unit |
|-----------------|---------------------------|------------------------|-----------------------------------------|------------------------|------|------|--------------|------|---------------|------|----|------|
|                 |                           | V <sub>CC</sub><br>(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**  
( $C_L = 50$  pF, Input  $t_r = t_f = 6$  ns)

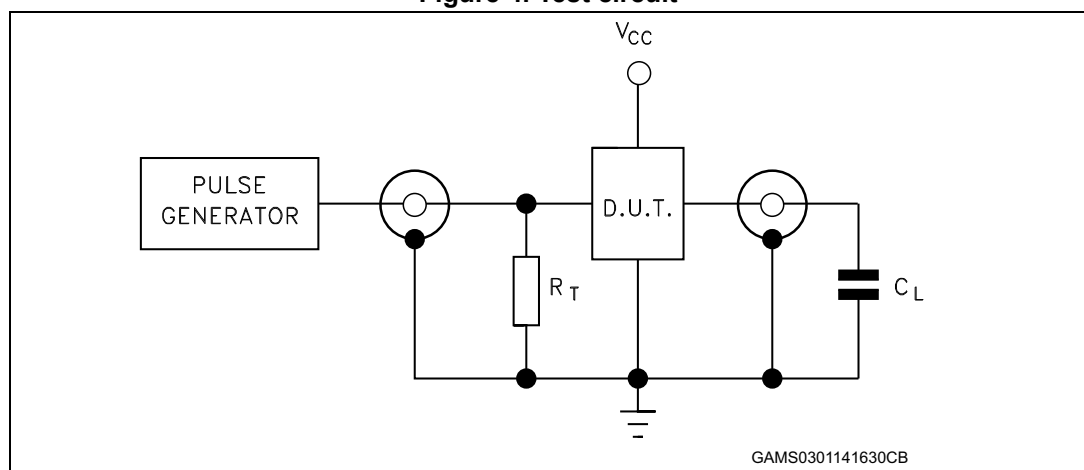
| Symbol                              | Parameter                                     | Test condition      | Value                  |      |      |              |      |               |      | Unit |
|-------------------------------------|-----------------------------------------------|---------------------|------------------------|------|------|--------------|------|---------------|------|------|
|                                     |                                               | 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. |      |
| t <sub>TLH</sub> , t <sub>THL</sub> | Output transition time                        | 2.0                 | -                      | 30   | 75   | -            | 95   | -             | 110  | ns   |
|                                     |                                               | 4.5                 |                        | 8    | 15   |              | 19   |               | 22   |      |
|                                     |                                               | 6.0                 |                        | 7    | 13   |              | 16   |               | 19   |      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation delay time (input to ΣEVEN, ΣODD) | 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 <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 |      |
| C <sub>IN</sub> | Input capacitance                            | 5.0                 | -                     | 5   | 10  | -            | 10  | -             | 10  | pF   |
| C <sub>PD</sub> | Power dissipation capacitance <sup>(1)</sup> |                     |                       | 61  |     |              |     |               |     |      |

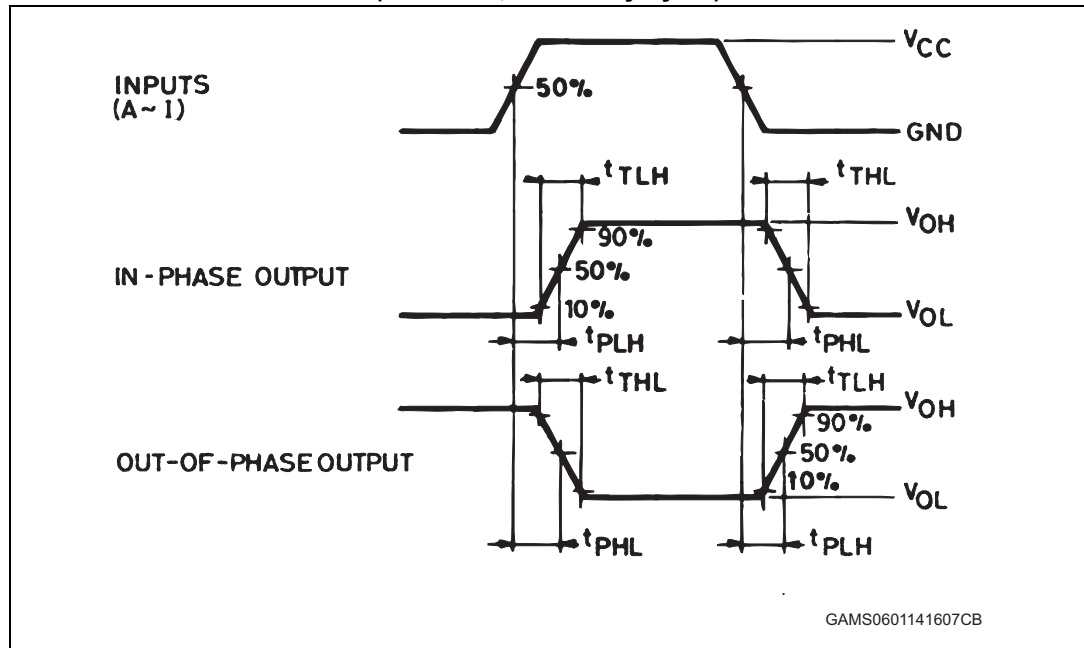
1.  $C_{PD}$  is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load (refer to test circuit). Average operating current can be obtained by the following equation:  
 $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN}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

**Figure 4. Test circuit**



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

Figure 5. Propagation delay time  
( $f = 1\text{ MHz}$ ; 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

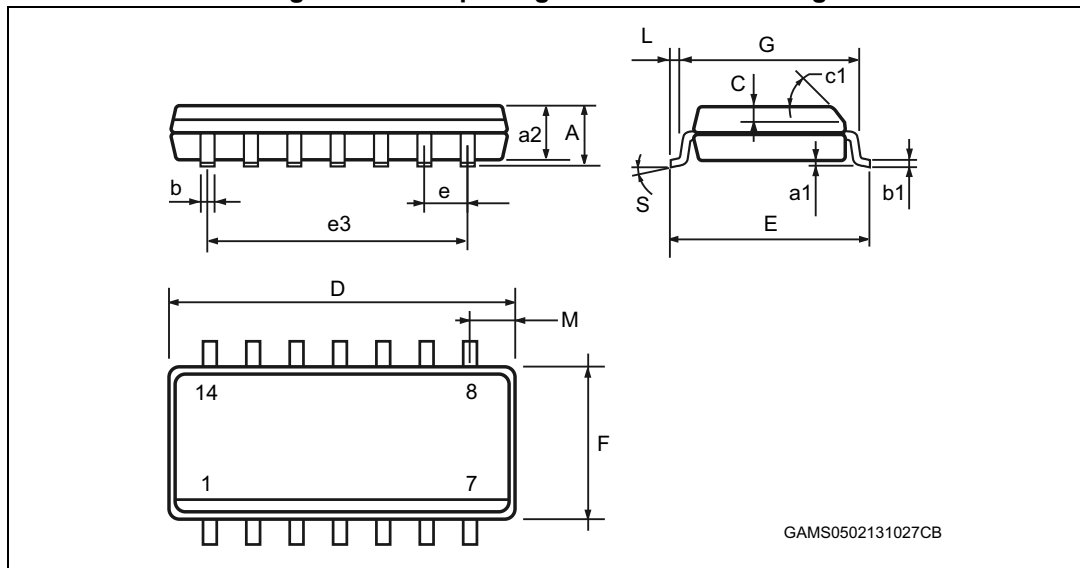


Table 9. SO14 package mechanical data

| 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

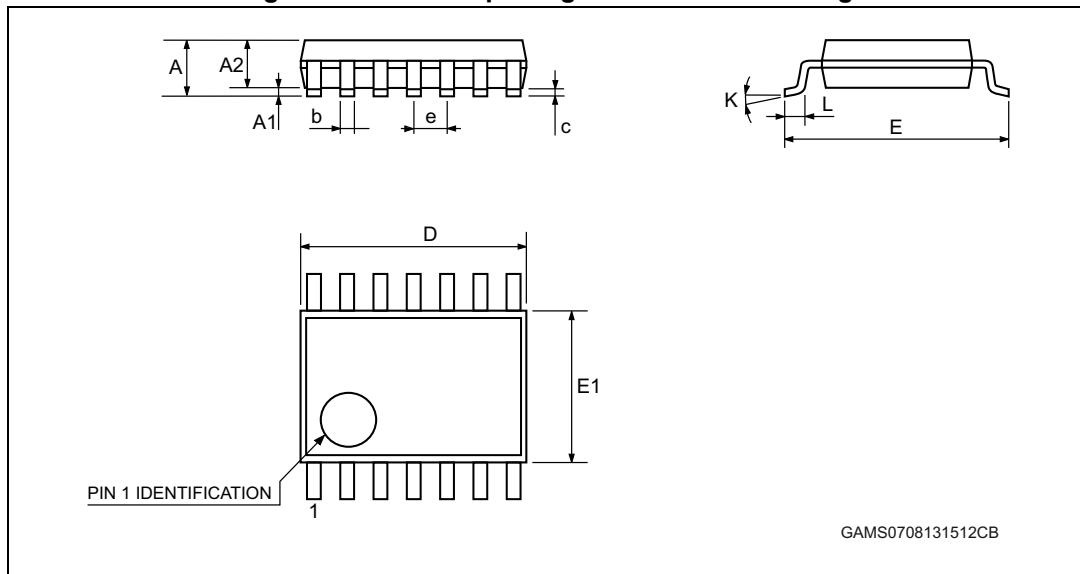


Table 10. TSSOP14 package mechanical data

| 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<br>Added ESD data<br><a href="#">Table 1: Device summary</a> : added automotive grade order codes, added temperature range, and marking details.<br>Added <a href="#">Section 5: Ordering information</a> . |

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