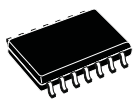
# M74HC280

## 9-bit parity generator

**Datasheet - production data**



SO14

TSSOP14

## Features

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

It is composed of nine data inputs (A to I) and odd/even parity outputs (ΣODD and ΣEVEN). The nine data inputs control the output conditions. When the number of high-level inputs is odd, ΣODD outputs are kept high and ΣEVEN outputs are kept low. Conversely, when the number of high-level outputs is even, ΣEVEN outputs are kept high and ΣODD 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 | S014 | Tape and reel | 74HC280 |
| M74HC280YRM13TR(1) | -40 °C to 125 °C | SO14 (automotive grade) | | 74HC280Y |
| M74HC280TTR | -55 °C to 125 °C | TSSOP14 | | HC280 |
| M74HC280YTTR(1) | -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

# 1 Pin information

**Figure 1. Pin connection and IED logic symbols**

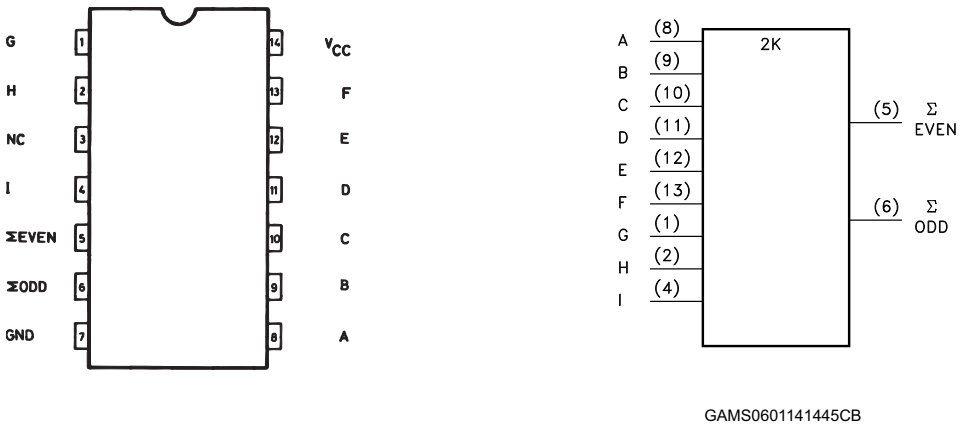



**Table 2. Pin description**

| Pin no | Symbol | Name and function |
|---|---|---|
| 5, 6 | ΣEVEN, ΣODD | 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**

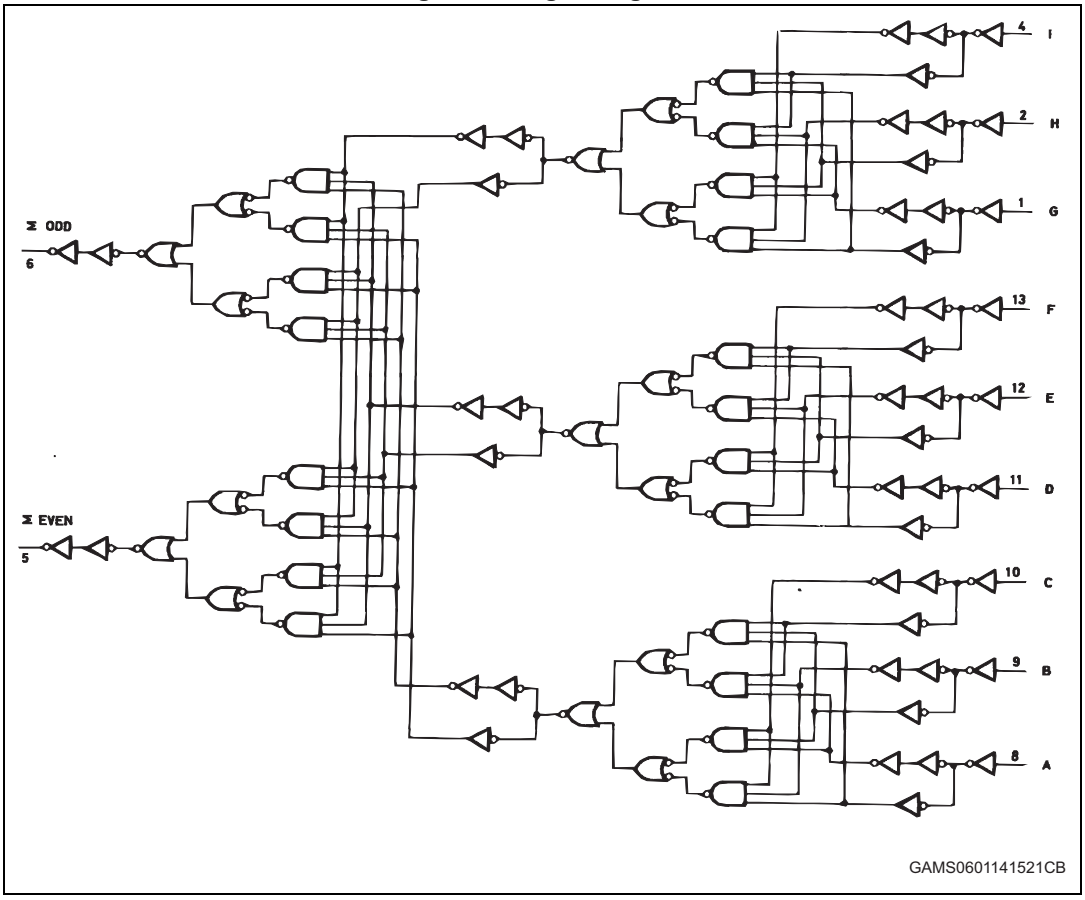
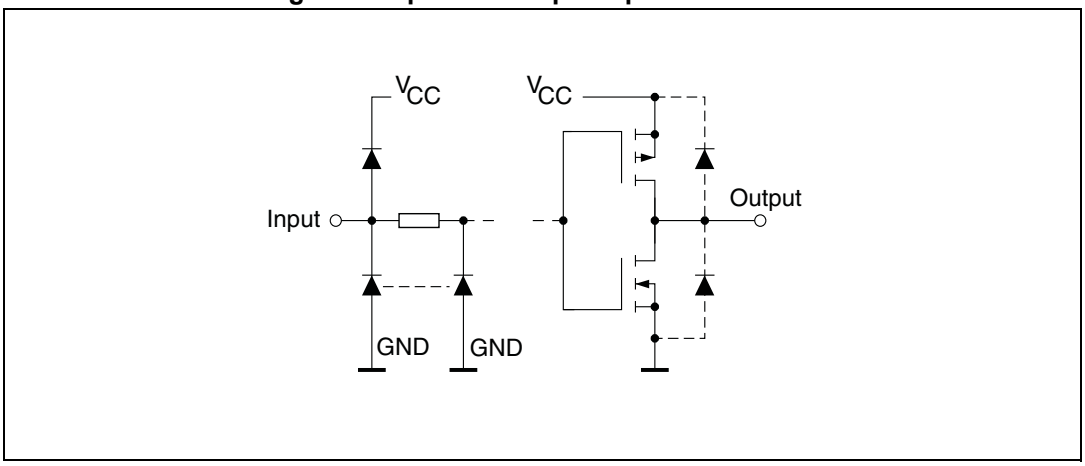



**Table 3. Truth table**

| 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 | ±20 | mA |
| $I_{OK}$ | DC output diode current | | |
| $I_O$ | DC output current | ±25 | |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or ground current | ±50 | |
| $P_D$ | Power dissipation | 500(1) | 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 |
| $t_r$, $t_f$ | Input rise and fall time | $V_{CC}$ = 2.0 V | 0 to 1000 | ns |
| | | $V_{CC}$ = 4.5 V | 0 to 500 | |
| | | $V_{CC}$ = 6.0 V | 0 to 400 | |

**Table 6. DC specifications**

| Symbol | Parameter | Test condition | | Value | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | | $T_A$ = 25 °C | | | -40 to 85 °C | | -55 to 125 °C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. | |
| $V_{IH}$ | 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 | | |
| $V_{IL}$ | 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 | |
| $V_{OH}$ | High level output voltage | 2.0 | $I_O$ = -20 µA | 1.9 | 2.0 | | 1.9 | | 1.9 | | V |
| | | 4.5 | $I_O$ = -20 µA | 4.4 | 4.5 | | 4.4 | | 4.4 | | |
| | | 6.0 | $I_O$ = -20 µA | 5.9 | 6.0 | | 5.9 | | 5.9 | | |
| | | 4.5 | $I_O$ = -4.0 mA | 4.18 | 4.31 | | 4.13 | | 4.10 | | |
| | | 6.0 | $I_O$ = -5.2 mA | 5.68 | 5.8 | | 5.63 | | 5.60 | | |
| $V_{OL}$ | Low level output voltage | 2.0 | $I_O$ = 20 µA | | | 0.1 | | 0.1 | | 0.1 | V |
| | | 4.5 | $I_O$ = 20 µA | | | 0.1 | | 0.1 | | 0.1 | |
| | | 6.0 | $I_O$ = 20 µA | | | 0.1 | | 0.1 | | 0.1 | |
| | | 4.5 | $I_O$ = 4.0 mA | | 0.17 | 0.26 | | 0.33 | | 0.40 | |
| | | 6.0 | $I_O$ = 5.2 mA | | 0.18 | 0.26 | | 0.33 | | 0.40 | |
| $I_I$ | Input leakage current | 6.0 | $V_I$ = $V_{CC}$ or GND | | | ±0.1 | | ±1 | | ±1 | µA |
| $I_{CC}$ | Quiescent supply current | 6.0 | $V_I$ = $V_{CC}$ or GND | | | 4 | | 40 | | 80 | µA |

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

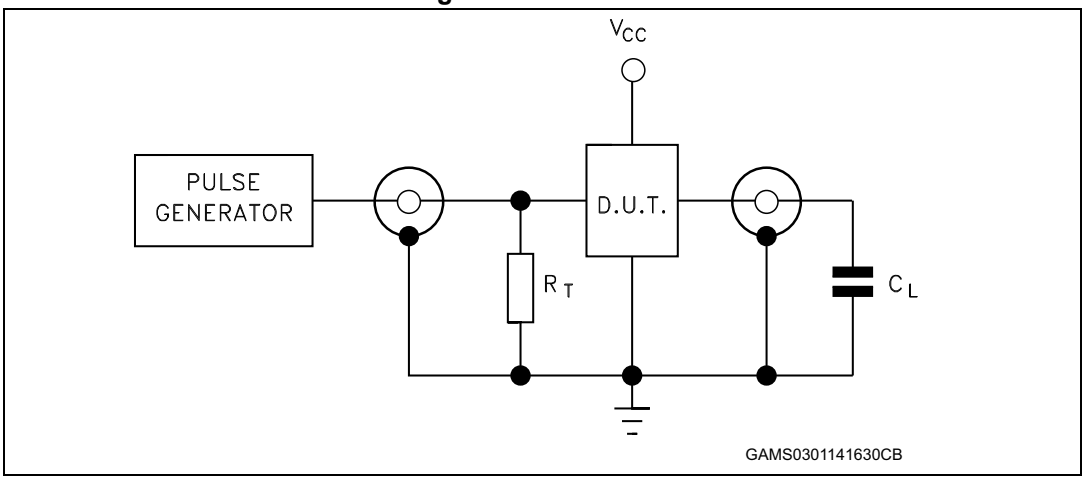
| Symbol | Parameter | Test condition | Value | | | | | | | Unit |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | $T_A$ = 25 °C | | | -40 to 85 °C | | -55 to 125 °C | | |
| | | | Min. | Typ. | Max. | Min. | Max. | Min. | Max. | |
| $t_{TLH}$, $t_{THL}$ | Output transition time | 2.0 | - | 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 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 |
|---|---|---|---|---|---|---|---|---|---|---|
| | | $V_{CC}$ (V) | $T_A$ = 25°C | | | -40 to 85 °C | | -55 to 125 °C | | |
| | | | Min | Typ | Max | Min | Max | Min | Max | |
| $C_{IN}$ | Input capacitance | 5.0 | - | 5 | 10 | - | 10 | - | 10 | pF |
| $C_{PD}$ | Power dissipation capacitance(1) | | | 61 | | | | | | |

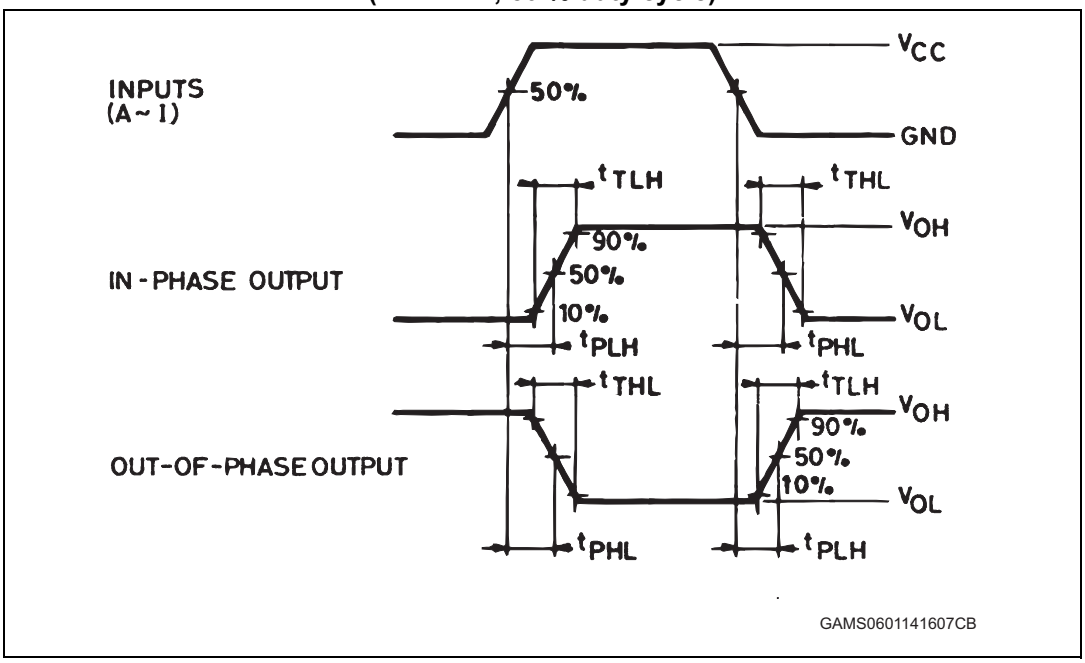
1. $C_{PD}$ is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load (refer to test circuit). Average operating current can be obtained by the following equation: $I_{CC(opr)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}$.

**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 Ω).

**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® 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.

## 4.1 SO14 package information

**Figure 6. SO14 package mechanical drawing**

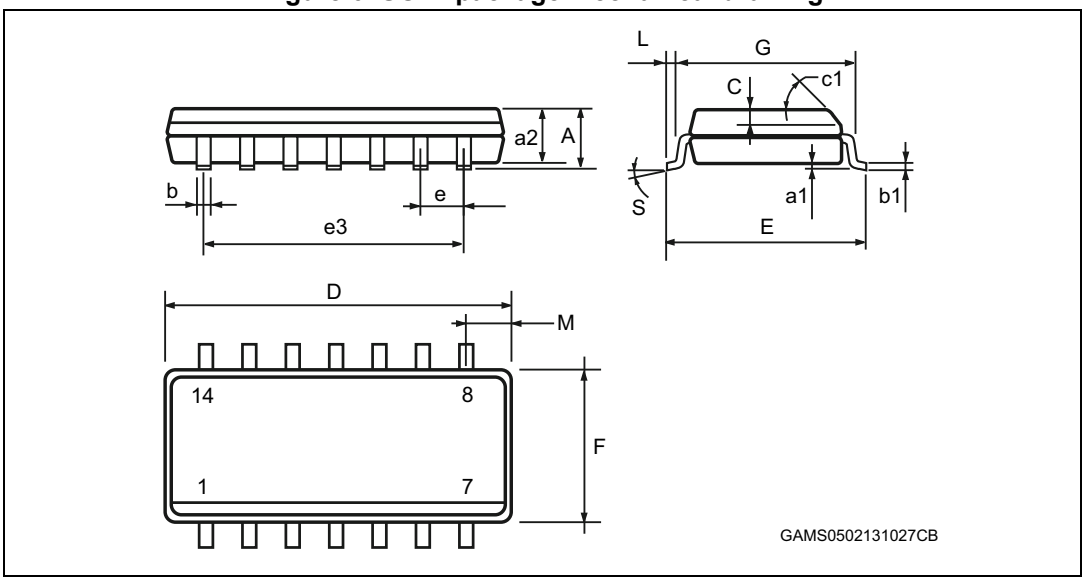



**Table 9. SO14 package mechanical data**

| 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**

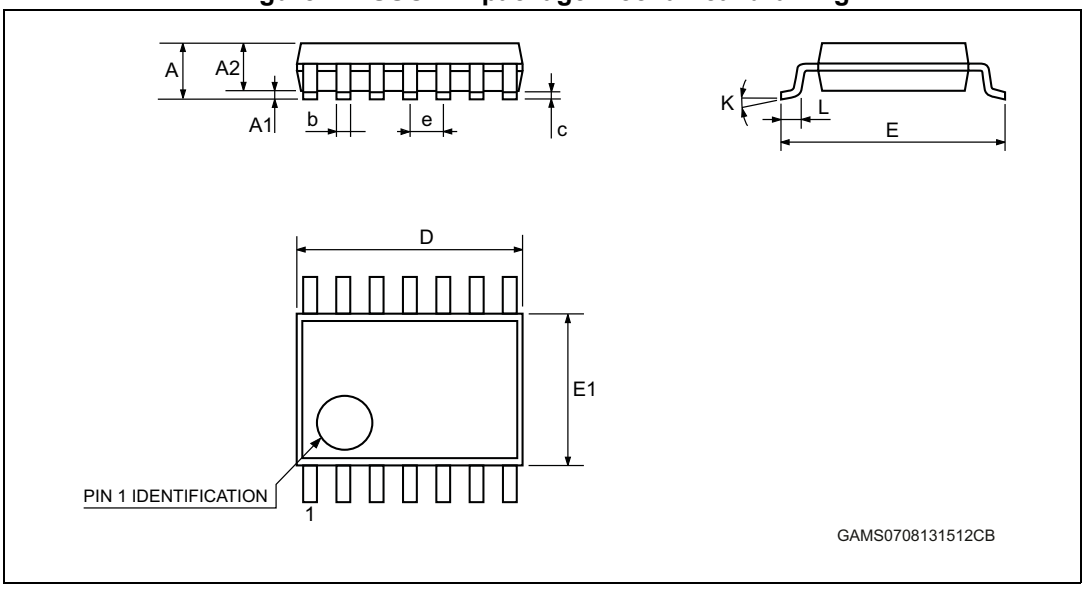



**Table 10. TSSOP14 package mechanical data**

| 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(1) | -40 °C to 125 °C | SO14 (automotive grade) | | 74HC280Y |
| M74HC280TTR | -55 °C to 125 °C | TSSOP14 | | HC280 |
| M74HC280YTTR(1) | -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>*Table 1: Device summary*: added automotive grade order codes, added temperature range, and marking details.<br>Added *Section 5: Ordering information*. |

**Please Read Carefully:**

Information in this document is provided solely in connection with ST products. STMicroelectronics NV and its subsidiaries (“ST”) reserve the right to make changes, corrections, modifications or improvements, to this document, and the products and services described herein at any time, without notice.

All ST products are sold pursuant to ST’s terms and conditions of sale.

Purchasers are solely responsible for the choice, selection and use of the ST products and services described herein, and ST assumes no liability whatsoever relating to the choice, selection or use of the ST products and services described herein.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted under this document. If any part of this document refers to any third party products or services it shall not be deemed a license grant by ST for the use of such third party products or services, or any intellectual property contained therein or considered as a warranty covering the use in any manner whatsoever of such third party products or services or any intellectual property contained therein.

**UNLESS OTHERWISE SET FORTH IN ST’S TERMS AND CONDITIONS OF SALE ST DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY WITH RESPECT TO THE USE AND/OR SALE OF ST PRODUCTS INCLUDING WITHOUT LIMITATION IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE (AND THEIR EQUIVALENTS UNDER THE LAWS OF ANY JURISDICTION), OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.**

**ST PRODUCTS ARE NOT DESIGNED OR AUTHORIZED FOR USE IN: (A) SAFETY CRITICAL APPLICATIONS SUCH AS LIFE SUPPORTING, ACTIVE IMPLANTED DEVICES OR SYSTEMS WITH PRODUCT FUNCTIONAL SAFETY REQUIREMENTS; (B) AERONAUTIC APPLICATIONS; (C) AUTOMOTIVE APPLICATIONS OR ENVIRONMENTS, AND/OR (D) AEROSPACE APPLICATIONS OR ENVIRONMENTS. WHERE ST PRODUCTS ARE NOT DESIGNED FOR SUCH USE, THE PURCHASER SHALL USE PRODUCTS AT PURCHASER’S SOLE RISK, EVEN IF ST HAS BEEN INFORMED IN WRITING OF SUCH USAGE, UNLESS A PRODUCT IS EXPRESSLY DESIGNATED BY ST AS BEING INTENDED FOR “AUTOMOTIVE, AUTOMOTIVE SAFETY OR MEDICAL” INDUSTRY DOMAINS ACCORDING TO ST PRODUCT DESIGN SPECIFICATIONS. PRODUCTS FORMALLY ESCC, QML OR JAN QUALIFIED ARE DEEMED SUITABLE FOR USE IN AEROSPACE BY THE CORRESPONDING GOVERNMENTAL AGENCY.**

Resale of ST products with provisions different from the statements and/or technical features set forth in this document shall immediately void any warranty granted by ST for the ST product or service described herein and shall not create or extend in any manner whatsoever, any liability of ST.

ST and the ST logo are trademarks or registered trademarks of ST in various countries.
Information in this document supersedes and replaces all information previously supplied.
The ST logo is a registered trademark of STMicroelectronics. All other names are the property of their respective owners.



STMicroelectronics group of companies

Australia - Belgium - Brazil - Canada - China - Czech Republic - Finland - France - Germany - Hong Kong - India - Israel - Italy - Japan - Malaysia - Malta - Morocco - Philippines - Singapore - Spain - Sweden - Switzerland - United Kingdom - United States of America

**www.st.com**