

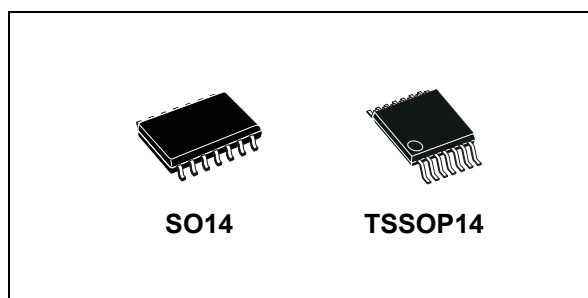


# THE DATASHEET OF M74HC126TTR



## Quad bus buffer (3-state)

Datasheet - production data



- 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 126
- ESD performance
  - CDM: 1 kV
  - HBM: 2 kV
  - MM: 200 V

### Features

- High-speed:  
 $t_{PD} = 8 \text{ ns (typ.) at } V_{CC} = 6 \text{ V}$
- Low power dissipation:  
 $I_{CC} = 4 \mu\text{A (max.) at } T_A = 25 \text{ }^\circ\text{C}$
- High noise immunity:  
 $V_{NIH} = V_{NIL} = 28 \% V_{CC} \text{ (min)}$
- Symmetrical output impedance:  
 $|I_{OH}| = I_{OL} = 6 \text{ mA (min.)}$

### Description

The M74HC126 is a high-speed CMOS quad buffer (3-state) fabricated with silicon gate C<sup>2</sup>MOS technology.

The device requires the 3-state control input, G, to be set high to place the output into high impedance state.

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

Table 1. Device summary

| Order code                     | Temp. range      | Package                    | Packaging     | Marking  |
|--------------------------------|------------------|----------------------------|---------------|----------|
| M74HC126RM13TR                 | -55 °C to 125 °C | S014                       | Tape and reel | 74HC126  |
| M74HC126YRM13TR <sup>(1)</sup> | -40 °C to 125 °C | SO14 (automotive grade)    |               | 74HC126Y |
| M74HC126TTR                    | -55 °C to 125 °C | TSSOP14                    |               | HC126    |
| M74HC126YTTR <sup>(1)</sup>    | -40 °C to 125 °C | TSSOP14 (automotive grade) |               | HC126Y   |

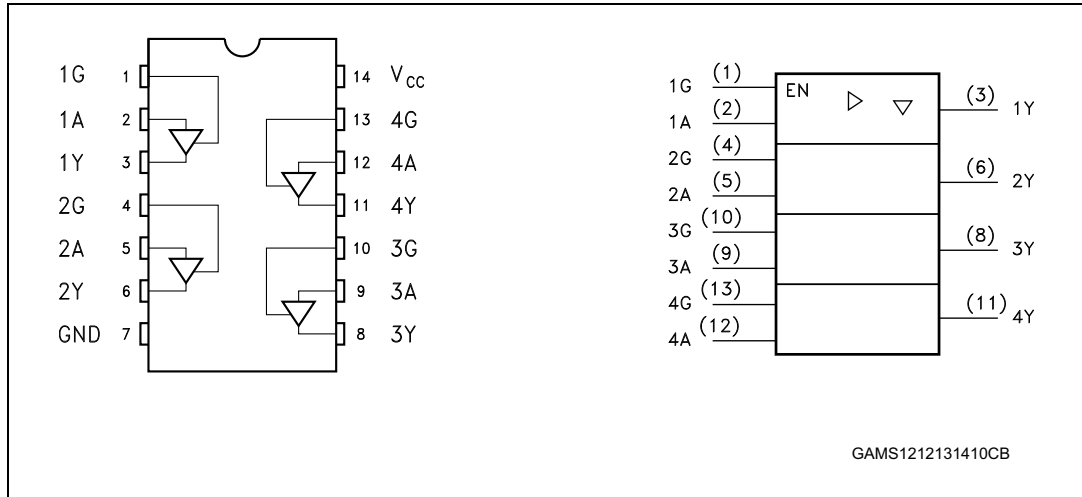
1. Qualification and characterization according to AEC Q100 and Q003 or equivalent, advanced screening according to AEC Q001 and Q002 or equivalent.

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# 1 Pin information

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



**Table 2. Pin description**

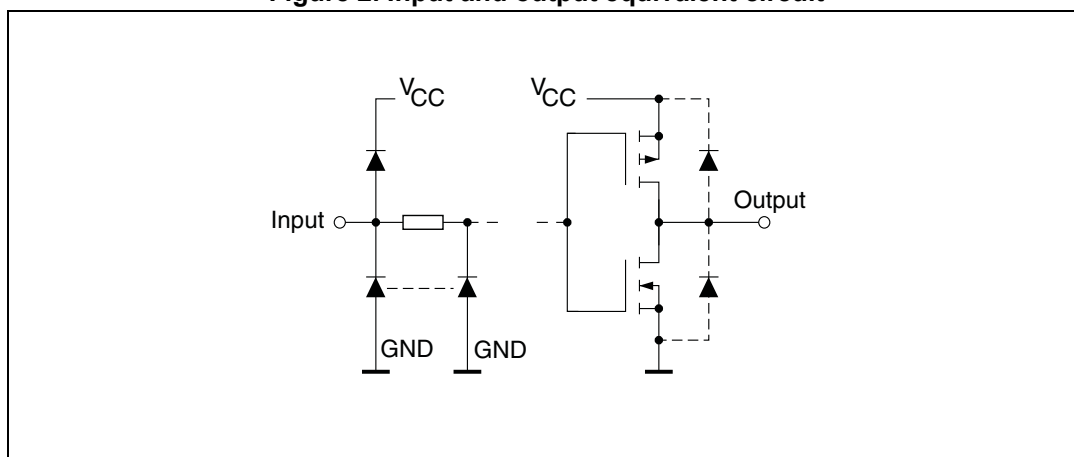
| Pin no       | Symbol          | Name and function       |
|--------------|-----------------|-------------------------|
| 1, 4, 10, 13 | 1G to 4G        | Output enable input     |
| 2, 5, 9, 12  | 1A to 4A        | Data inputs             |
| 3, 6, 8, 11  | 1Y to 4Y        | Data outputs         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

## 2 Functional description

Table 3. Truth table

| A | G | Y |
|---|---|---|
| X | L | Z |
| L | H | L |
| H | H | H |

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             | $\pm 35$               |      |
| $I_{CC}$ or $I_{GND}$ | DC $V_{CC}$ or ground current | $\pm 70$               |      |
| $P_D$                 | 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        |    |
| $t_r, t_f$ | 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><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> = -6.0 mA   | 4.18                   | 4.31 |      | 4.13         |      | 4.10          |      |      |
|                 |                                       | 6.0                    | I <sub>O</sub> = -7.8 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   |                        | 0.0  | 0.1  |              | 0.1  |               | 0.1  | V    |
|                 |                                       | 4.5                    | I <sub>O</sub> = 20 μA   |                        | 0.0  | 0.1  |              | 0.1  |               | 0.1  |      |
|                 |                                       | 6.0                    | I <sub>O</sub> = 20 μA   |                        | 0.0  | 0.1  |              | 0.1  |               | 0.1  |      |
|                 |                                       | 4.5                    | I <sub>O</sub> = 6.0 mA  |                        | 0.17 | 0.26 |              | 0.33 |               | 0.40 |      |
|                 |                                       | 6.0                    | I <sub>O</sub> = 7.8 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>OZ</sub> | High impedance output leakage current | 6.0                    | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub><br>V <sub>O</sub> = V <sub>CC</sub> or GND |                        |      | ±0.5 |              | ±5   |               | ±10  | 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**  
(Input  $t_r = t_f = 6$  ns)

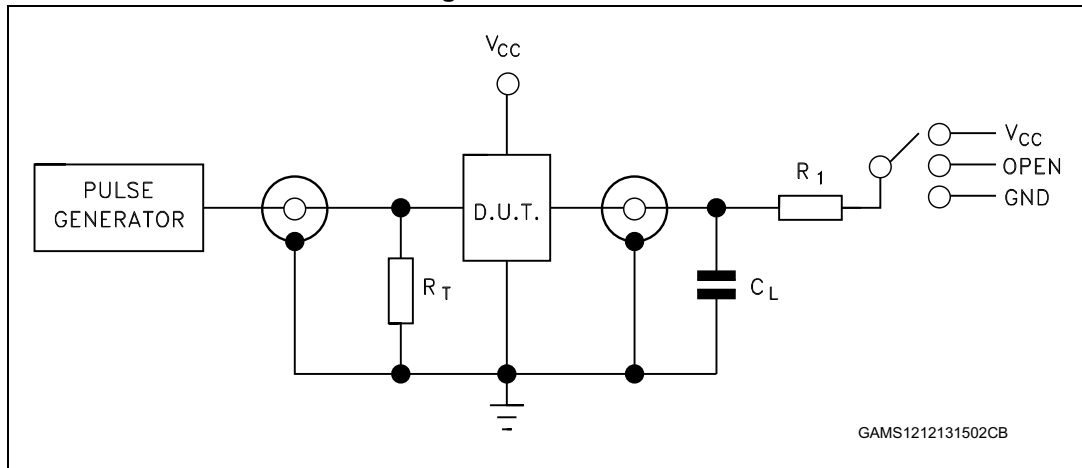
| Symbol                              | Parameter                          | Test condition         |                        |                       | Value                  |      |      |              |      |               |      |     | Unit |
|-------------------------------------|------------------------------------|------------------------|------------------------|-----------------------|------------------------|------|------|--------------|------|---------------|------|-----|------|
|                                     |                                    | V <sub>CC</sub><br>(V) | C <sub>L</sub><br>(pF) |                       | 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                    | 50                     |                       |                        | 20   | 60   |              | 75   |               | 90   | ns  |      |
|                                     |                                    | 4.5                    |                        |                       | 6                      | 12   |      | 15           |      | 18            |      |     |      |
|                                     |                                    | 6.0                    |                        |                       | 5                      | 10   |      | 13           |      | 15            |      |     |      |
| t <sub>PLH</sub> , t <sub>PHL</sub> | Propagation delay time             | 2.0                    | 50                     |                       |                        | 36   | 75   |              | 95   |               | 110  | ns  |      |
|                                     |                                    | 4.5                    |                        |                       | 9                      | 15   |      | 19           |      | 22            |      |     |      |
|                                     |                                    | 6.0                    |                        |                       | 8                      | 13   |      | 16           |      | 19            |      |     |      |
|                                     |                                    | 2.0                    | 150                    |                       |                        | 52   | 105  |              | 130  |               | 160  | ns  |      |
|                                     |                                    | 4.5                    |                        |                       | 13                     | 21   |      | 26           |      | 32            |      |     |      |
|                                     |                                    | 6.0                    |                        |                       | 11                     | 18   |      | 22           |      | 27            |      |     |      |
| t <sub>PZL</sub> , t <sub>PZH</sub> | High impedance output enable time  | 2.0                    | 50                     | R <sub>L</sub> = 1 kΩ |                        |      | 36   | 75           |      | 95            |      | 110 | ns   |
|                                     |                                    | 4.5                    |                        |                       |                        | 9    | 15   |              | 19   |               | 22   |     |      |
|                                     |                                    | 6.0                    |                        |                       |                        | 8    | 13   |              | 16   |               | 19   |     |      |
|                                     |                                    | 2.0                    | 150                    |                       |                        |      | 52   | 105          |      | 130           |      | 160 | ns   |
|                                     |                                    | 4.5                    |                        |                       |                        | 13   | 21   |              | 26   |               | 32   |     |      |
|                                     |                                    | 6.0                    |                        |                       |                        | 11   | 18   |              | 22   |               | 27   |     |      |
| t <sub>PLZ</sub> , t <sub>PHZ</sub> | High impedance output disable time | 2.0                    | 50                     | R <sub>L</sub> = 1 kΩ |                        |      | 48   | 80           |      | 100           |      | 120 | ns   |
|                                     |                                    | 4.5                    |                        |                       |                        | 12   | 16   |              | 20   |               | 24   |     |      |
|                                     |                                    | 6.0                    |                        |                       |                        | 10   | 14   |              | 17   |               | 20   |     |      |

**Table 8. Capacitive characteristics**

| Sym             | 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 |    |      |
| C <sub>IN</sub> | Input capacitance                            | 5.0                    | -                      | 5   | 10  | -            | 10  | -             | 10  | pF |      |
| C <sub>PD</sub> | Power dissipation capacitance <sup>(1)</sup> |                        | -                      | 35  | -   | -            | -   | -             |     |    |      |

1. C<sub>PD</sub> 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 buffer).

Figure 3. Test circuit

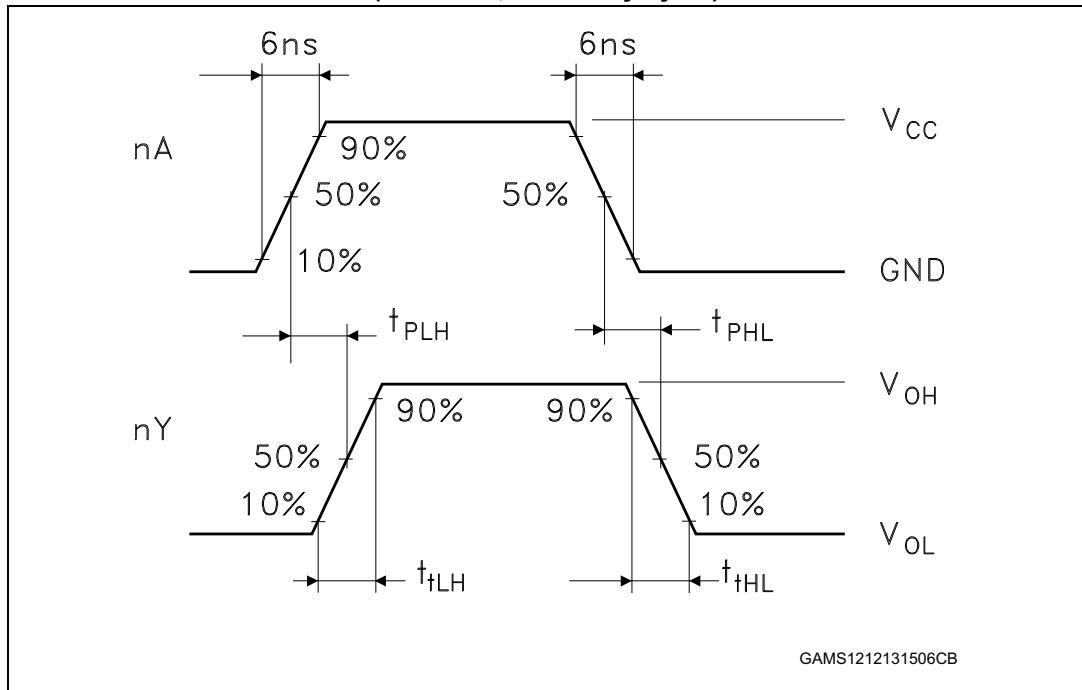


- Legend:  
 $C_L = 50 \text{ pF}/150 \text{ pF}$  or equivalent (includes jig and probe capacitance).  
 $R_1 = 1 \text{ k}\Omega$  or equivalent.  
 $R_T = Z_{OUT}$  of pulse generator (typically  $50 \Omega$ ).

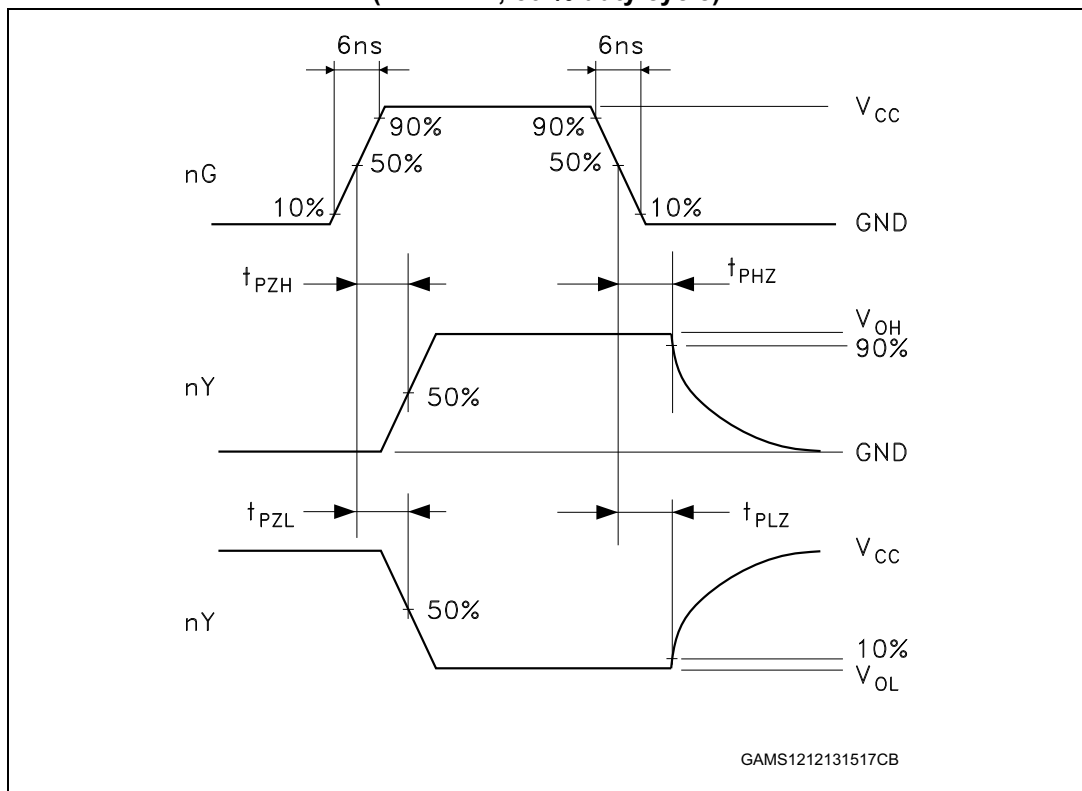
Table 9. Propagation delay time configuration

| Test               | Switch   |
|--------------------|----------|
| $t_{PLH}, t_{PHL}$ | Open     |
| $t_{PZL}, t_{PLZ}$ | $V_{CC}$ |
| $t_{PZH}, t_{PHZ}$ | GND      |

**Figure 4. Waveform 1: propagation delay times**  
(f = 1 MHz; 50 % duty cycle)



**Figure 5. Waveform 2: Output enable and disable 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 6. SO14 package mechanical drawing

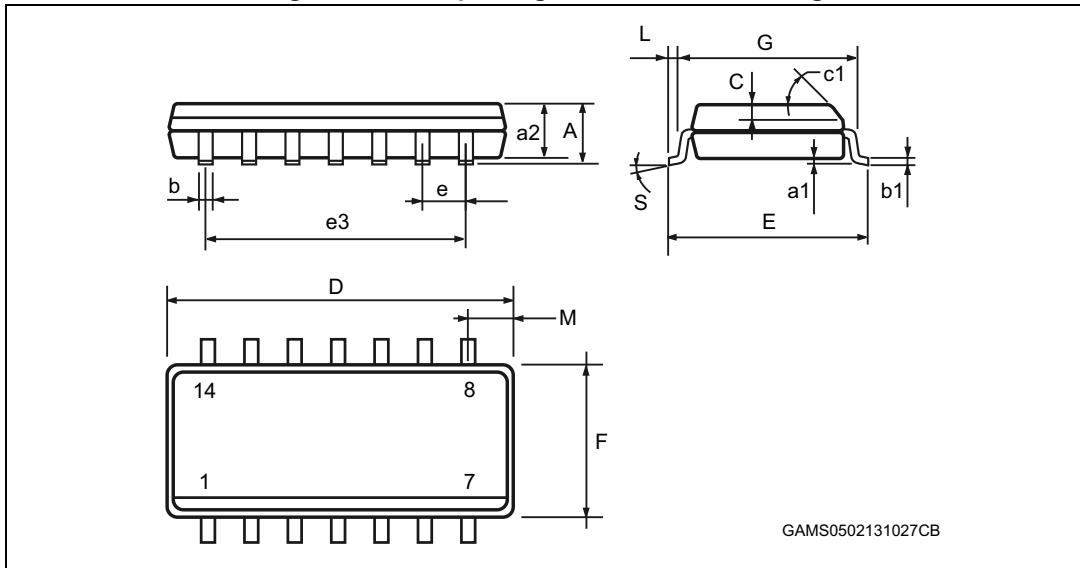


Table 10. SO14 package mechanical data

| 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

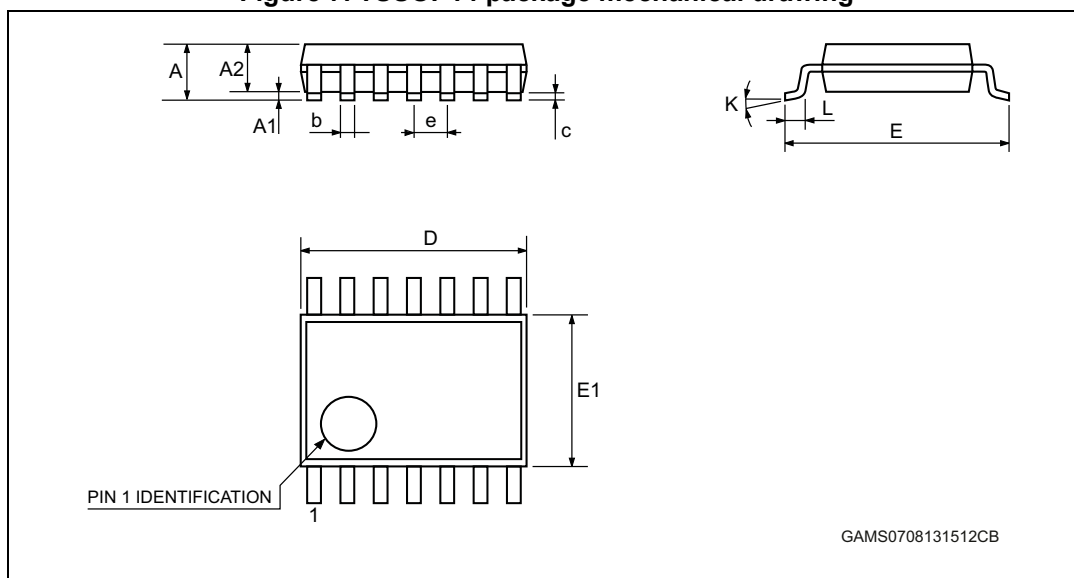


Table 11. TSSOP14 package mechanical data

| 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 12. Order codes

| Order code                     | Temp. range      | Package                    | Packaging     | Marking  |
|--------------------------------|------------------|----------------------------|---------------|----------|
| M74HC126RM13TR                 | -55 °C to 125 °C | S014                       | Tape and reel | 74HC126  |
| M74HC126YRM13TR <sup>(1)</sup> | -40 °C to 125 °C | SO14 (automotive grade)    |               | 74HC126Y |
| M74HC126TTR                    | -55 °C to 125 °C | TSSOP14                    |               | HC126    |
| M74HC126YTTR <sup>(1)</sup>    | -40 °C to 125 °C | TSSOP14 (automotive grade) |               | HC126Y   |

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 13. Document revision history

| Date        | Revision | Changes   |
|-------------|----------|---|
| Aug-2001    | 1        | Initial release.  |
| 13-Dec-2013 | 3        | Removed DIP14 package<br><a href="#">Features</a> : added ESD information<br><a href="#">Table 1: Device summary</a> : updated order codes, added automotive grade order codes, added temperature range and marking details.<br>Added <a href="#">Section 5: Ordering information</a> . |

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