

# 74HC27; 74HCT27

## Triple 3-input NOR gate

Product data sheet

### 1. General description

The 74HC27; 74HCT27 is a high-speed Si-gate CMOS device and is pin compatible with Low-Power Schottky TTL (LSTTL).

The 74HC27; 74HCT27 provides the 3-input NOR function.

### 2. Features

- Multiple package options
- Complies with JEDEC standard no. 7A
- ESD protection:
  - ◆ HBM JESD22-A114E exceeds 2000 V
  - ◆ MM JESD22-A115-A exceeds 200 V
- Specified from  $-40\text{ }^{\circ}\text{C}$  to  $+85\text{ }^{\circ}\text{C}$  and from  $-40\text{ }^{\circ}\text{C}$  to  $+125\text{ }^{\circ}\text{C}$

### 3. Ordering information

Table 1. Ordering information

| Type number | Package   |          |   |          |
|-------------|---|----------|---|----------|
|             | Temperature range   | Name     | Description   | Version  |
| 74HC27N     | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | DIP14    | plastic dual in-line package; 14 leads (300 mil)  | SOT27-1  |
| 74HC27D     | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SO14     | plastic small outline package; 14 leads; body width 3.9 mm  | SOT108-1 |
| 74HC27DB    | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SSOP14   | plastic shrink small outline package; 14 leads; body width 5.3 mm   | SOT337-1 |
| 74HC27PW    | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | TSSOP14  | plastic thin shrink small outline package; 14 leads; body width 4.4 mm  | SOT402-1 |
| 74HC27BQ    | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | DHVQFN14 | plastic dual in-line compatible thermal enhanced very thin quad flat package; no leads; 14 terminals; body $2.5 \times 3 \times 0.85\text{ mm}$ | SOT762-1 |
| 74HCT27N    | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | DIP14    | plastic dual in-line package; 14 leads (300 mil)  | SOT27-1  |
| 74HCT27D    | $-40\text{ }^{\circ}\text{C}$ to $+125\text{ }^{\circ}\text{C}$ | SO14     | plastic small outline package; 14 leads; body width 3.9 mm  | SOT108-1 |

## 6. Functional description

Table 3. Function table<sup>[1]</sup>

| Inputs |    |    | Outputs |
|--------|----|----|---------|
| nA     | nB | nC | nY      |
| L      | L  | L  | H       |
| X      | X  | H  | L       |
| X      | H  | X  | L       |
| H      | X  | X  | L       |

- [1] H = HIGH voltage level;  
 L = LOW voltage level;  
 X = don't care.

## 7. Limiting values

Table 4. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Voltages are referenced to GND (ground = 0 V).

| Symbol           | Parameter                             | Conditions  | Min  | Max  | Unit |
|------------------|---------------------------------------|---|------|------|------|
| V <sub>CC</sub>  | supply voltage                        |   | -0.5 | +7   | V    |
| I <sub>IK</sub>  | input clamping current                | V <sub>I</sub> < -0.5 V or V <sub>I</sub> > V <sub>CC</sub> + 0.5 V | [1]  | ±20  | mA   |
| I <sub>OK</sub>  | output clamping current               | V <sub>O</sub> < -0.5 V or V <sub>O</sub> > V <sub>CC</sub> + 0.5 V | [1]  | ±20  | mA   |
| I <sub>O</sub>   | output current                        | -0.5 V < V <sub>O</sub> < V <sub>CC</sub> + 0.5 V                   | -    | ±25  | mA   |
| I <sub>CC</sub>  | supply current                        |   | -    | 50   | mA   |
| I <sub>GND</sub> | ground current                        |   | -50  | -    | mA   |
| T <sub>stg</sub> | storage temperature                   |   | -65  | +150 | °C   |
| P <sub>tot</sub> | total power dissipation               |   | [2]  |      |      |
|                  | DIP14 package                         |   | -    | 750  | mW   |
|                  | SO14, (T)SSOP14 and DHVQFN14 packages |   | -    | 500  | mW   |

- [1] The input and output voltage ratings may be exceeded if the input and output current ratings are observed.  
 [2] For DIP14 package: P<sub>tot</sub> derates linearly with 12 mW/K above 70 °C.  
 For SO14 package: P<sub>tot</sub> derates linearly with 8 mW/K above 70 °C.  
 For (T)SSOP14 packages: P<sub>tot</sub> derates linearly with 5.5 mW/K above 60 °C.  
 For DHVQFN14 packages: P<sub>tot</sub> derates linearly with 4.5 mW/K above 60 °C.

## 8. Recommended operating conditions

Table 5. Recommended operating conditions

| Symbol             | Parameter      | Conditions | Min | Typ | Max             | Unit |
|--------------------|----------------|------------|-----|-----|-----------------|------|
| <b>Type 74HC27</b> |                |            |     |     |                 |      |
| V <sub>CC</sub>    | supply voltage |            | 2.0 | 5.0 | 6.0             | V    |
| V <sub>I</sub>     | input voltage  |            | 0   | -   | V <sub>CC</sub> | V    |
| V <sub>O</sub>     | output voltage |            | 0   | -   | V <sub>CC</sub> | V    |

**Table 5. Recommended operating conditions ...continued**

| Symbol                          | Parameter                 | Conditions              | Min | Typ | Max  | Unit |
|---------------------------------|---------------------------|-------------------------|-----|-----|------|------|
| t <sub>r</sub> , t <sub>f</sub> | input rise and fall times | V <sub>CC</sub> = 2.0 V | -   | -   | 1000 | ns   |
|                                 |                           | V <sub>CC</sub> = 4.5 V | -   | 6.0 | 500  | ns   |
|                                 |                           | V <sub>CC</sub> = 6.0 V | -   | -   | 400  | ns   |
| T <sub>amb</sub>                | ambient temperature       |                         | -40 | -   | +125 | °C   |

**Type 74HCT27**

|                                 |                           |                         |     |     |                 |    |
|---------------------------------|---------------------------|-------------------------|-----|-----|-----------------|----|
| V <sub>CC</sub>                 | supply voltage            |                         | 4.5 | 5.0 | 5.5             | V  |
| V <sub>I</sub>                  | input voltage             |                         | 0   | -   | V <sub>CC</sub> | V  |
| V <sub>O</sub>                  | output voltage            |                         | 0   | -   | V <sub>CC</sub> | V  |
| t <sub>r</sub> , t <sub>f</sub> | input rise and fall times | V <sub>CC</sub> = 4.5 V | -   | 6.0 | 500             | ns |
| T <sub>amb</sub>                | ambient temperature       |                         | -40 | -   | +125            | °C |

## 9. Static characteristics

**Table 6. Static characteristics type 74HC27; 74HCT27**

At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol          | Parameter   | Conditions   | 25 °C |      |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|-----------------|---|--|-------|------|------|------------------|------|-------------------|------|------|
|                 |   |  | Min   | Typ  | Max  | Min              | Max  | Min               | Max  |      |
| <b>74HC27</b>   |   |  |       |      |      |                  |      |                   |      |      |
| V <sub>IH</sub> | HIGH-level input voltage                          | V <sub>CC</sub> = 2.0 V  | 1.5   | 1.2  | -    | 1.5              | -    | 1.5               | -    | V    |
|                 |   | V <sub>CC</sub> = 4.5 V  | 3.15  | 2.4  | -    | 3.15             | -    | 3.15              | -    | V    |
|                 |   | V <sub>CC</sub> = 6.0 V  | 4.2   | 3.2  | -    | 4.2              | -    | 4.2               | -    | V    |
| V <sub>IL</sub> | LOW-level input voltage                           | V <sub>CC</sub> = 2.0 V  | -     | 0.8  | 0.5  | -                | 0.5  | -                 | 0.5  | V    |
|                 |   | V <sub>CC</sub> = 4.5 V  | -     | 2.1  | 1.35 | -                | 1.35 | -                 | 1.35 | V    |
|                 |   | V <sub>CC</sub> = 6.0 V  | -     | 2.8  | 1.8  | -                | 1.8  | -                 | 1.8  | V    |
| V <sub>OH</sub> | HIGH-level output voltage                         | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    |       |      |      |                  |      |                   |      |      |
|                 |   | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 2.0 V                                       | 1.9   | 2.0  | -    | 1.9              | -    | 1.9               | -    | V    |
|                 |   | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 4.5 V                                       | 4.4   | 4.5  | -    | 4.4              | -    | 4.4               | -    | V    |
|                 |   | I <sub>O</sub> = -20 μA; V <sub>CC</sub> = 6.0 V                                       | 5.9   | 6.0  | -    | 5.9              | -    | 5.9               | -    | V    |
|                 |   | I <sub>O</sub> = -4.0 mA; V <sub>CC</sub> = 4.5 V                                      | 3.98  | 4.32 | -    | 3.84             | -    | 3.7               | -    | V    |
|                 | I <sub>O</sub> = -5.2 mA; V <sub>CC</sub> = 6.0 V | 5.48   | 5.81  | -    | 5.34 | -                | 5.2  | -                 | V    |      |
| V <sub>OL</sub> | LOW-level output voltage                          | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub>                                    |       |      |      |                  |      |                   |      |      |
|                 |   | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 2.0 V  | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |   | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 4.5 V  | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |   | I <sub>O</sub> = 20 μA; V <sub>CC</sub> = 6.0 V  | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                 |   | I <sub>O</sub> = 4.0 mA; V <sub>CC</sub> = 4.5 V                                       | -     | 0.15 | 0.26 | -                | 0.33 | -                 | 0.4  | V    |
|                 | I <sub>O</sub> = 5.2 mA; V <sub>CC</sub> = 6.0 V  | -  | 0.16  | 0.26 | -    | 0.33             | -    | 0.4               | V    |      |
| I <sub>I</sub>  | input leakage current                             | V <sub>I</sub> = V <sub>CC</sub> or GND; V <sub>CC</sub> = 6.0 V                       | -     | -    | ±0.1 | -                | ±1.0 | -                 | ±1.0 | μA   |
| I <sub>CC</sub> | supply current                                    | V <sub>I</sub> = V <sub>CC</sub> or GND; I <sub>O</sub> = 0 A; V <sub>CC</sub> = 6.0 V | -     | -    | 2.0  | -                | 20   | -                 | 40   | μA   |
| C <sub>I</sub>  | input capacitance                                 |  | -     | 3.5  | -    | -                | -    | -                 | -    | pF   |

**Table 6. Static characteristics type 74HC27; 74HCT27 ...continued**  
 At recommended operating conditions; voltages are referenced to GND (ground = 0 V).

| Symbol           | Parameter                 | Conditions  | 25 °C |      |      | -40 °C to +85 °C |      | -40 °C to +125 °C |      | Unit |
|------------------|---------------------------|---|-------|------|------|------------------|------|-------------------|------|------|
|                  |                           |   | Min   | Typ  | Max  | Min              | Max  | Min               | Max  |      |
| <b>74HCT27</b>   |                           |   |       |      |      |                  |      |                   |      |      |
| V <sub>IH</sub>  | HIGH-level input voltage  | V <sub>CC</sub> = 4.5 V to 5.5 V  | 2.0   | 1.6  | -    | 2.0              | -    | 2.0               | -    | V    |
| V <sub>IL</sub>  | LOW-level input voltage   | V <sub>CC</sub> = 4.5 V to 5.5 V  | -     | 1.2  | 0.8  | -                | 0.8  | -                 | 0.8  | V    |
| V <sub>OH</sub>  | HIGH-level output voltage | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V   |       |      |      |                  |      |                   |      |      |
|                  |                           | I <sub>O</sub> = -20 µA   | 4.4   | 4.5  | -    | 4.4              | -    | 4.4               | -    | V    |
|                  |                           | I <sub>O</sub> = -4.0 mA  | 3.98  | 4.32 | -    | 3.84             | -    | 3.7               | -    | V    |
| V <sub>OL</sub>  | LOW-level output voltage  | V <sub>I</sub> = V <sub>IH</sub> or V <sub>IL</sub> ; V <sub>CC</sub> = 4.5 V   |       |      |      |                  |      |                   |      |      |
|                  |                           | I <sub>O</sub> = 20 µA  | -     | 0    | 0.1  | -                | 0.1  | -                 | 0.1  | V    |
|                  |                           | I <sub>O</sub> = 4.0 mA   | -     | 0.16 | 0.26 | -                | 0.33 | -                 | 0.4  | V    |
| I <sub>I</sub>   | input leakage current     | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>V <sub>CC</sub> = 5.5 V   | -     | -    | ±0.1 | -                | ±1.0 | -                 | ±1.0 | µA   |
| I <sub>CC</sub>  | supply current            | V <sub>I</sub> = V <sub>CC</sub> or GND;<br>V <sub>CC</sub> = 5.5 V; I <sub>O</sub> = 0 A   | -     | -    | 2.0  | -                | 20   | -                 | 40   | µA   |
| ΔI <sub>CC</sub> | additional supply current | per input pin;<br>V <sub>I</sub> = V <sub>CC</sub> - 2.1 V;<br>other inputs at V <sub>CC</sub> or GND;<br>V <sub>CC</sub> = 4.5 V to 5.5 V;<br>I <sub>O</sub> = 0 A |       |      |      |                  |      |                   |      |      |
|                  |                           | nA, nB or nC inputs   | -     | 150  | 540  | -                | 675  | -                 | 735  | µA   |
| C <sub>I</sub>   | input capacitance         |   | -     | 3.5  | -    | -                | -    | -                 | -    | pF   |

## 10. Dynamic characteristics

**Table 7. Dynamic characteristics type 74HC27; 74HCT27**  
 GND = 0 V; for load circuit see [Figure 7](#).

| Symbol          | Parameter         | Conditions   | 25 °C |     |     | -40 °C to +125 °C |              | Unit |
|-----------------|-------------------|--|-------|-----|-----|-------------------|--------------|------|
|                 |                   |  | Min   | Typ | Max | Max (85 °C)       | Max (125 °C) |      |
| <b>74HC27</b>   |                   |  |       |     |     |                   |              |      |
| t <sub>pd</sub> | propagation delay | nA, nB, nC to nY; see <a href="#">Figure 6</a> <a href="#">[1]</a> |       |     |     |                   |              |      |
|                 |                   | V <sub>CC</sub> = 2.0 V  | -     | 28  | 90  | 115               | 135          | ns   |
|                 |                   | V <sub>CC</sub> = 4.5 V  | -     | 10  | 18  | 23                | 27           | ns   |
|                 |                   | V <sub>CC</sub> = 5.0 V; C <sub>L</sub> = 15 pF                    | -     | 8   | -   | -                 | -            | ns   |
|                 |                   | V <sub>CC</sub> = 6.0 V  | -     | 8   | 15  | 20                | 23           | ns   |
| t <sub>t</sub>  | transition time   | see <a href="#">Figure 6</a> <a href="#">[2]</a>                   |       |     |     |                   |              |      |
|                 |                   | V <sub>CC</sub> = 2.0 V  | -     | 19  | 75  | 95                | 110          | ns   |
|                 |                   | V <sub>CC</sub> = 4.5 V  | -     | 7   | 15  | 19                | 22           | ns   |
|                 |                   | V <sub>CC</sub> = 6.0 V  | -     | 6   | 13  | 16                | 19           | ns   |

**Table 7. Dynamic characteristics type 74HC27; 74HCT27**

$GND = 0\text{ V}$ ; for load circuit see [Figure 7](#).

| Symbol         | Parameter                     | Conditions   | 25 °C |     |     | -40 °C to +125 °C |              | Unit |    |
|----------------|-------------------------------|--|-------|-----|-----|-------------------|--------------|------|----|
|                |                               |  | Min   | Typ | Max | Max (85 °C)       | Max (125 °C) |      |    |
| $C_{PD}$       | power dissipation capacitance | per package; $V_I = GND$ to $V_{CC}$                   | [3]   | -   | 24  | -                 | -            | -    | pF |
| <b>74HCT27</b> |                               |  |       |     |     |                   |              |      |    |
| $t_{pd}$       | propagation delay             | nA, nB, nC to nY; see <a href="#">Figure 6</a>         | [1]   | -   | -   | -                 | -            | -    | -  |
|                |                               | $V_{CC} = 4.5\text{ V}$                                |       | -   | 12  | 21                | 26           | 32   | ns |
|                |                               | $V_{CC} = 5.0\text{ V}$ ; $C_L = 15\text{ pF}$         |       | -   | 10  | -                 | -            | -    | ns |
| $t_t$          | transition time               | $V_{CC} = 4.5\text{ V}$ ; see <a href="#">Figure 6</a> | [2]   | -   | 7   | 15                | 19           | 22   | ns |
| $C_{PD}$       | power dissipation capacitance | per package; $V_I = GND$ to $V_{CC} - 1.5\text{ V}$    | [3]   | -   | 30  | -                 | -            | -    | pF |

[1]  $t_{pd}$  is the same as  $t_{PHL}$  and  $t_{PLH}$ .

[2]  $t_t$  is the same as  $t_{THL}$  and  $t_{TLH}$ .

[3]  $C_{PD}$  is used to determine the dynamic power dissipation ( $P_D$  in  $\mu\text{W}$ ):

$$P_D = C_{PD} \times V_{CC}^2 \times f_i \times N + \sum (C_L \times V_{CC}^2 \times f_o) \text{ where:}$$

$f_i$  = input frequency in MHz;

$f_o$  = output frequency in MHz;

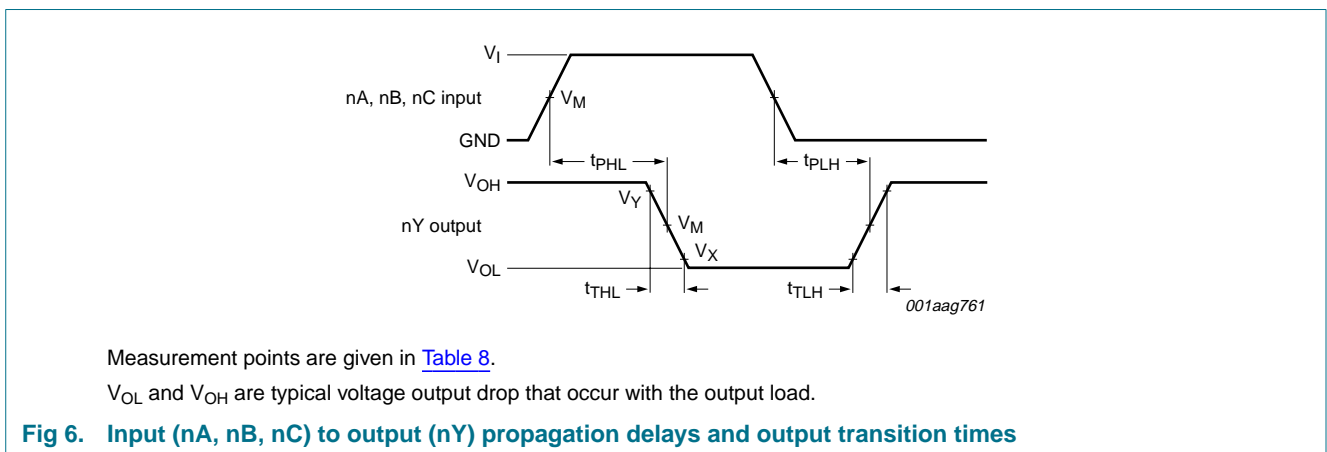
$C_L$  = output load capacitance in pF;

$V_{CC}$  = supply voltage in V;

$N$  = number of inputs switching;

$\sum (C_L \times V_{CC}^2 \times f_o)$  = sum of outputs.

## 11. Waveforms



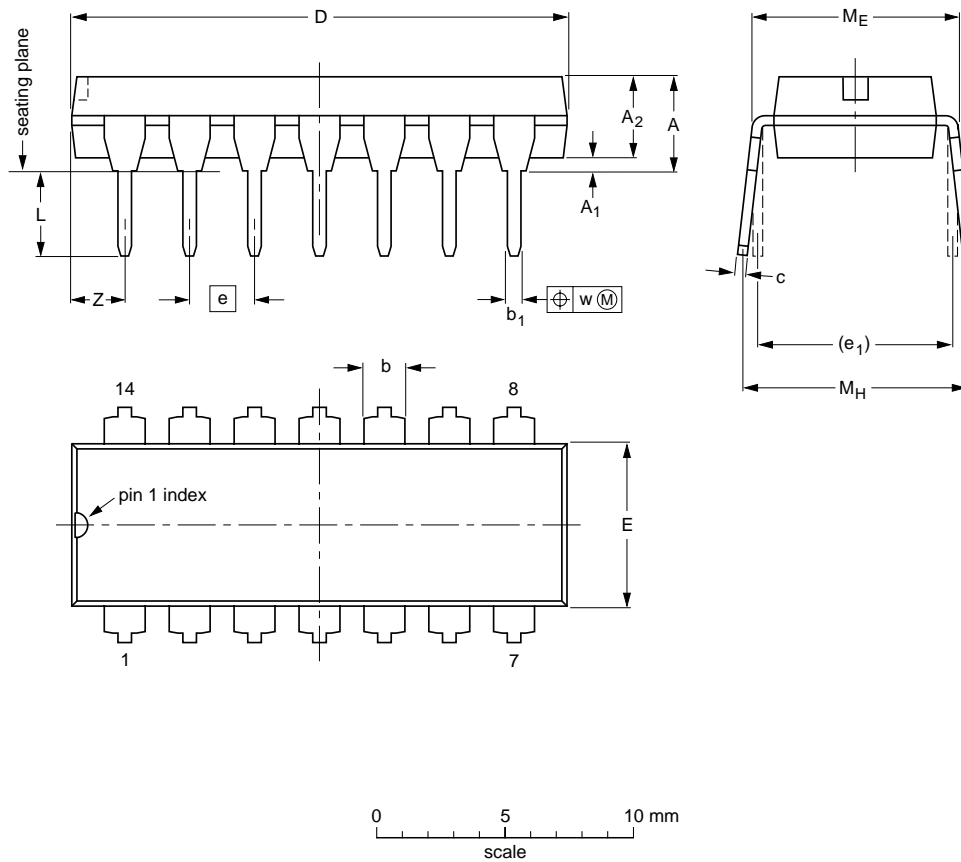
**Table 8. Measurement points**

| Type    | Input       | Output      |             |             |
|---------|-------------|-------------|-------------|-------------|
|         | $V_M$       | $V_M$       | $V_X$       | $V_Y$       |
| 74HC27  | $0.5V_{CC}$ | $0.5V_{CC}$ | $0.1V_{CC}$ | $0.9V_{CC}$ |
| 74HCT27 | 1.3 V       | 1.3 V       | $0.1V_{CC}$ | $0.9V_{CC}$ |

12. Package outline

DIP14: plastic dual in-line package; 14 leads (300 mil)

SOT27-1



DIMENSIONS (inch dimensions are derived from the original mm dimensions)

| UNIT   | A max. | A <sub>1</sub> min. | A <sub>2</sub> max. | b              | b <sub>1</sub> | c              | D <sup>(1)</sup> | E <sup>(1)</sup> | e    | e <sub>1</sub> | L            | M <sub>E</sub> | M <sub>H</sub> | w     | Z <sup>(1)</sup> max. |
|--------|--------|---------------------|---------------------|----------------|----------------|----------------|------------------|------------------|------|----------------|--------------|----------------|----------------|-------|-----------------------|
| mm     | 4.2    | 0.51                | 3.2                 | 1.73<br>1.13   | 0.53<br>0.38   | 0.36<br>0.23   | 19.50<br>18.55   | 6.48<br>6.20     | 2.54 | 7.62           | 3.60<br>3.05 | 8.25<br>7.80   | 10.0<br>8.3    | 0.254 | 2.2                   |
| inches | 0.17   | 0.02                | 0.13                | 0.068<br>0.044 | 0.021<br>0.015 | 0.014<br>0.009 | 0.77<br>0.73     | 0.26<br>0.24     | 0.1  | 0.3            | 0.14<br>0.12 | 0.32<br>0.31   | 0.39<br>0.33   | 0.01  | 0.087                 |

Note

1. Plastic or metal protrusions of 0.25 mm (0.01 inch) maximum per side are not included.

| OUTLINE VERSION | REFERENCES |        |           | EUROPEAN PROJECTION |
|-----------------|------------|--------|-----------|---------------------|
|                 | IEC        | JEDEC  | JEITA     |                     |
| SOT27-1         | 050G04     | MO-001 | SC-501-14 |                     |

Fig 8. Package outline SOT27-1 (DIP14)