# DATA SHEET

## 74ABT00
## Quad 2-input NAND gate

Product specification

IC23 Data Handbook

1995 Sep 18

Philips
Semiconductors

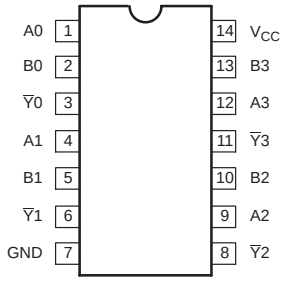
PHILIPS

# Quad 2-input NAND gate 74ABT00

## QUICK REFERENCE DATA

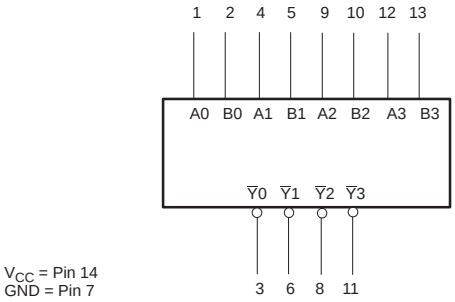
| SYMBOL | PARAMETER | CONDITIONS $T_{amb}$ = 25°C; GND = 0V | TYPICAL | UNIT |
|---|---|---|---|---|
| $t_{PLH}$ $t_{PHL}$ | Propagation delay An or Bn to $\overline{Y}$n | $C_L$ = 50pF; $V_{CC}$ = 5V | 2.5 2.0 | ns |
| $t_{OSLH}$ $t_{OSHL}$ | Output to Output skew | | 0.4 | ns |
| $C_{IN}$ | Input capacitance | $V_I$ = 0V or $V_{CC}$ | 3 | pF |
| $I_{CC}$ | Total supply current | Outputs disabled; $V_{CC}$ = 5.5V | 50 | µA |

## PIN CONFIGURATION



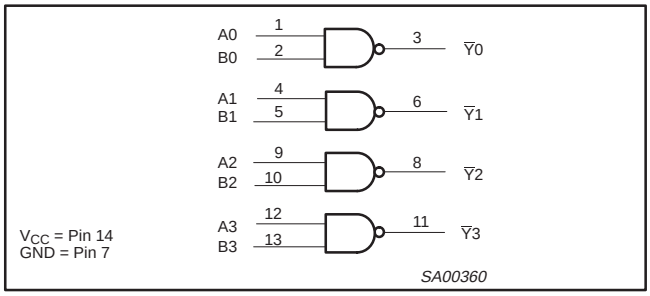

SA00333

## LOGIC SYMBOL




SA00334

## LOGIC DIAGRAM

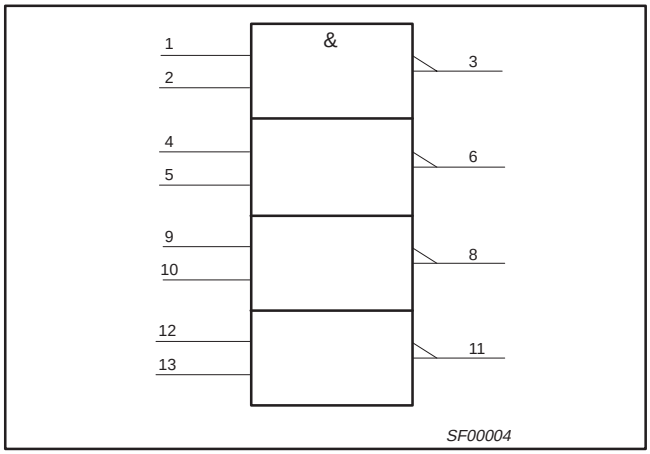



SA00360

## PIN DESCRIPTION

| PIN NUMBER | SYMBOL | NAME AND FUNCTION |
|---|---|---|
| 1, 2, 4, 5, 9, 10, 12, 13 | An-Bn | Data inputs |
| 3, 6, 8, 11 | $\overline{Y}$n | Data outputs |
| 7 | GND | Ground (0V) |
| 14 | $V_{CC}$ | Positive supply voltage |

## LOGIC SYMBOL (IEEE/IEC)




SF00004

## FUNCTION TABLE

| INPUTS | | OUTPUT |
|---|---|---|
| A | B | $\overline{Y}$ |
| L | L | H |
| L | H | H |
| H | L | H |
| H | H | L |

**NOTES:**
H = High voltage level
L = Low voltage level

## ORDERING INFORMATION

| PACKAGES | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DWG NUMBER |
|---|---|---|---|---|
| 14-Pin Plastic DIP | –40°C to +85°C | 74ABT00 N | 74ABT00 N | SOT27-1 |
| 14-Pin plastic SO | –40°C to +85°C | 74ABT00 D | 74ABT00 D | SOT108-1 |
| 14-Pin Plastic SSOP Type II | –40°C to +85°C | 74ABT00 DB | 74ABT00 DB | SOT337-1 |
| 14-Pin Plastic TSSOP Type I | –40°C to +85°C | 74ABT00 PW | 74ABT00PW DH | SOT402-1 |

## ABSOLUTE MAXIMUM RATINGS[1, 2]

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|---|---|---|---|---|
| $V_{CC}$ | DC supply voltage | | –0.5 to +7.0 | V |
| $I_{IK}$ | DC input diode current | $V_I < 0$ | –18 | mA |
| $V_I$ | DC input voltage[3] | | –1.2 to +7.0 | V |
| $I_{OK}$ | DC output diode current | $V_O < 0$ | –50 | mA |
| $V_{OUT}$ | DC output voltage[3] | output in Off or High state | –0.5 to +5.5 | V |
| $I_{OUT}$ | DC output current | output in Low state | 40 | mA |
| $T_{stg}$ | Storage temperature range | | –65 to 150 | °C |

**NOTES:**
1. Stresses beyond those listed may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.
2. The performance capability of a high-performance integrated circuit in conjunction with its thermal environment can create junction temperatures which are detrimental to reliability. The maximum junction temperature of this integrated circuit should not exceed 150°C.
3. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

## RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | UNIT |
|---|---|---|---|---|
| | | MIN | MAX | |
| $V_{CC}$ | DC supply voltage | 4.5 | 5.5 | V |
| $V_I$ | Input voltage | 0 | $V_{CC}$ | V |
| $V_{IH}$ | High-level input voltage | 2.0 | | V |
| $V_{IL}$ | Low-level input voltage | | 0.8 | V |
| $I_{OH}$ | High-level output current | | –15 | mA |
| $I_{OL}$ | Low-level output current | | 20 | mA |
| $\Delta t/\Delta v$ | Input transition rise or fall rate | 0 | 5 | ns/V |
| $T_{amb}$ | Operating free-air temperature range | –40 | +85 | °C |

## DC ELECTRICAL CHARACTERISTICS

| SYMBOL | PARAMETER | TEST CONDITIONS | LIMITS | | | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | $T_{amb}$ = +25°C | | | $T_{amb}$ = –40°C to +85°C | | |
| | | | MIN | TYP | MAX | MIN | MAX | |
| $V_{IK}$ | Input clamp voltage | $V_{CC}$ = 4.5V; $I_{IK}$ = –18mA | | –0.9 | –1.2 | | –1.2 | V |
| $V_{OH}$ | High-level output voltage | $V_{CC}$ = 4.5V; $I_{OH}$ = –15mA; $V_I$ = $V_{IL}$ or $V_{IH}$ | 2.5 | 2.9 | | 2.5 | | V |
| $V_{OL}$ | Low-level output voltage | $V_{CC}$ = 4.5V; $I_{OL}$ = 20mA; $V_I$ = $V_{IL}$ or $V_{IH}$ | | 0.35 | 0.5 | | 0.5 | V |
| $I_I$ | Input leakage current | $V_{CC}$ = 5.5V; $V_I$ = GND or 5.5V | | ±0.01 | ±1.0 | | ±1.0 | µA |
| $I_{OFF}$ | Power-off leakage current | $V_{CC}$ = 0.0V; $V_O$ or $V_I \leq$ 4.5V | | ±5.0 | ±100 | | ±100 | µA |
| $I_{CEX}$ | Output High leakage current | $V_{CC}$ = 5.5V; $V_O$ = 5.5V; $V_I$ = GND or $V_{CC}$ | | 5.0 | 50 | | 50 | µA |
| $I_O$ | Output current[1] | $V_{CC}$ = 5.5V; $V_O$ = 2.5V | –50 | –75 | –180 | –50 | –180 | mA |
| $I_{CC}$ | Quiescent supply current | $V_{CC}$ = 5.5V; $V_I$ = GND or $V_{CC}$ | | 2 | 50 | | 50 | µA |
| $\Delta I_{CC}$ | Additional supply current per input pin[2] | $V_{CC}$ = 5.5V; One data input at 3.4V, other inputs at $V_{CC}$ or GND | | 0.25 | 500 | | 500 | µA |

**NOTES:**
1. Not more than one output should be tested at a time, and the duration of the test should not exceed one second.
2. This is the increase in supply current for each input at 3.4V.

## AC CHARACTERISTICS

GND = 0V; $t_R = t_F$ = 2.5ns; $C_L$ = 50pF, $R_L$ = 500Ω

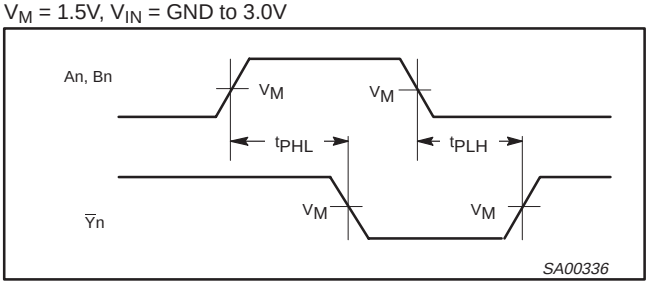
| SYMBOL | PARAMETER | WAVEFORM | LIMITS | | | | | UNIT |
|---|---|---|---|---|---|---|---|---|
| | | | $T_{amb}$ = +25°C $V_{CC}$ = +5.0V | | | $T_{amb}$ = –40°C to +85°C $V_{CC}$ = +5.0V ±0.5V | | |
| | | | MIN | TYP | MAX | MIN | MAX | |
| $t_{PLH}$<br>$t_{PHL}$ | Propagation delay<br>An or Bn to $\overline{Y}$n | 1 | 1.0<br>1.0 | 2.5<br>2.0 | 3.6<br>2.8 | 1.0<br>1.0 | 4.1<br>3.4 | ns |
| $t_{OSHL}$<br>$t_{OSLH}$[1] | Output to Output skew<br>An or Bn to $\overline{Y}$n | 2 | | 0.4<br>0.4 | 0.5<br>0.5 | | 0.5<br>0.5 | ns |

**NOTE:**

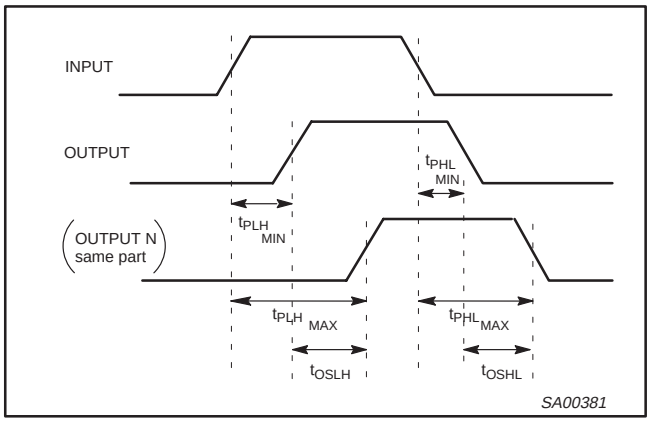
1. Skew is defined as the absolute value of the difference between the actual propagation delay for any two separate outputs of the same device. The specification applies to any outputs switching in the the same direction, either HIGH-to-LOW ($t_{OSHL}$) or LOW-to-HIGH ($t_{OSLH}$); parameter guaranteed by design.

## AC WAVEFORMS

$V_M$ = 1.5V, $V_{IN}$ = GND to 3.0V

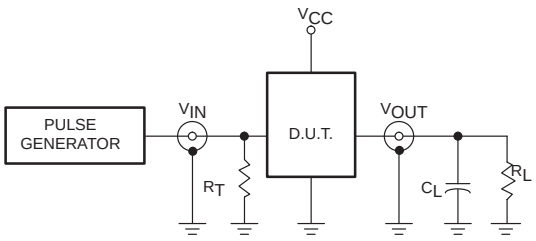



**Waveform 1. Propagation delay for inverting outputs**

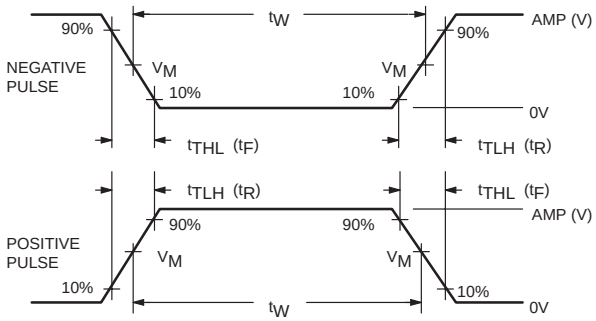



**Waveform 2. Common edge skew**

## TEST CIRCUIT AND WAVEFORMS




**Test Circuit for Outputs**




$V_M$ = 1.5V

**Input Pulse Definition**

### DEFINITIONS

$R_L$ = Load resistor; see AC CHARACTERISTICS for value.

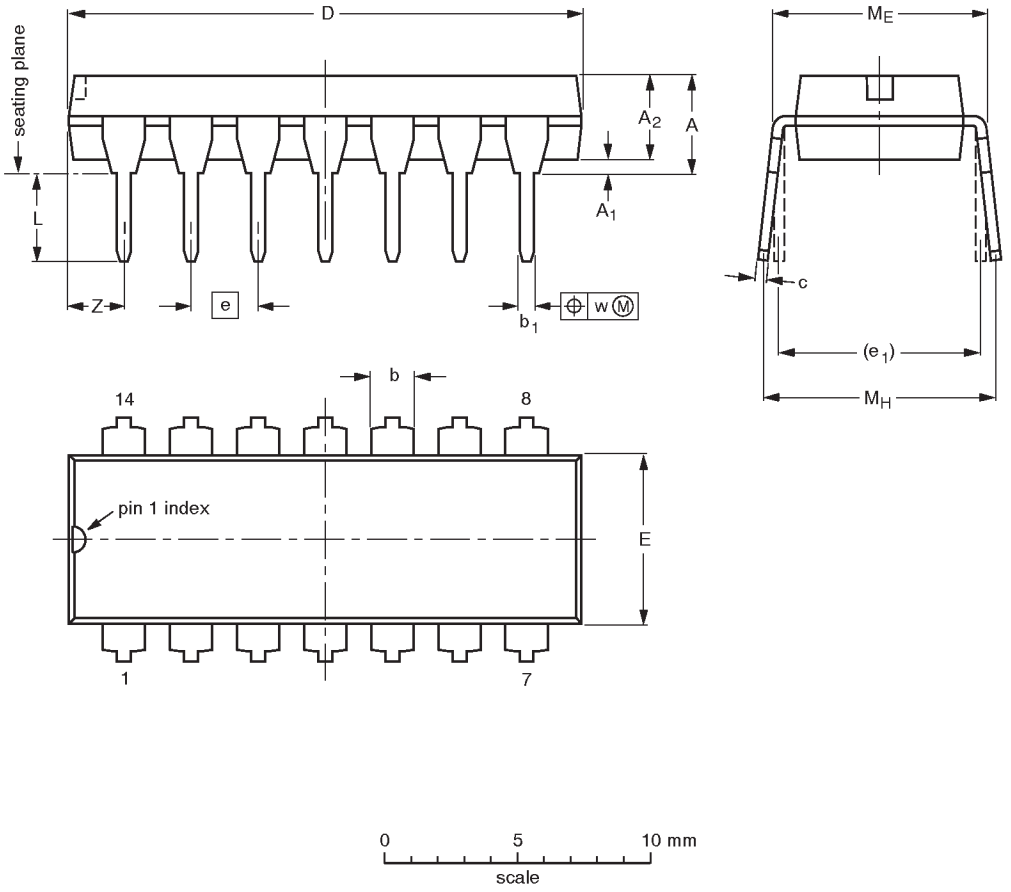
$C_L$ = Load capacitance includes jig and probe capacitance; see AC CHARACTERISTICS for value.

$R_T$ = Termination resistance should be equal to $Z_{OUT}$ of pulse generators.

| FAMILY | INPUT PULSE REQUIREMENTS | | | | |
|---|---|---|---|---|---|
| | Amplitude | Rep. Rate | $t_W$ | $t_R$ | $t_F$ |
| 74ABT | 3.0V | 1MHz | 500ns | 2.5ns | 2.5ns |

SH00067

**DIP14: plastic dual in-line package; 14 leads (300 mil)** **SOT27-1**




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

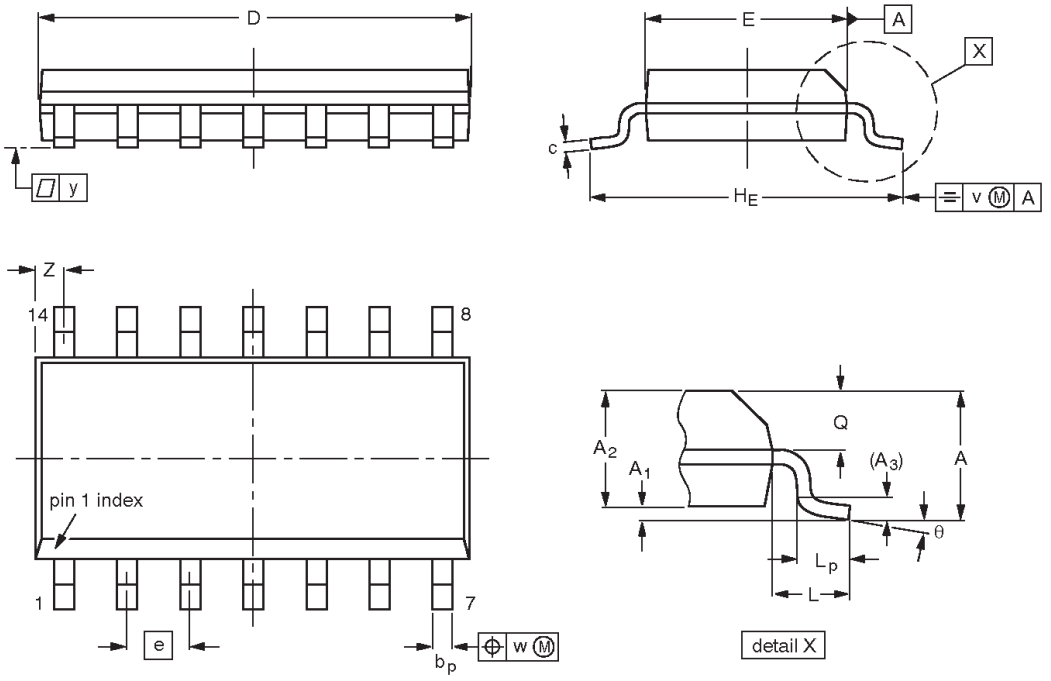
| UNIT | A max. | $A_1$ min. | $A_2$ max. | b | $b_1$ | c | D (1) | E (1) | e | $e_1$ | L | $M_E$ | $M_H$ | w | Z (1) max. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 4.2 | 0.51 | 3.2 | 1.73<br>1.13 | 0.53<br>0.38 | 0.36<br>0.23 | 19.50<br>18.55 | 6.48<br>6.20 | 2.54 | 7.62 | 3.60<br>3.05 | 8.25<br>7.80 | 10.0<br>8.3 | 0.254 | 2.2 |
| inches | 0.17 | 0.020 | 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 | 0.10 | 0.30 | 0.14<br>0.12 | 0.32<br>0.31 | 0.39<br>0.33 | 0.01 | 0.087 |

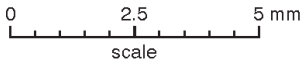
**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT27-1 | 050G04 | MO-001AA | | | | ~~92-11-17~~<br>95-03-11 |

**SO14: plastic small outline package; 14 leads; body width 3.9 mm** **SOT108-1**




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

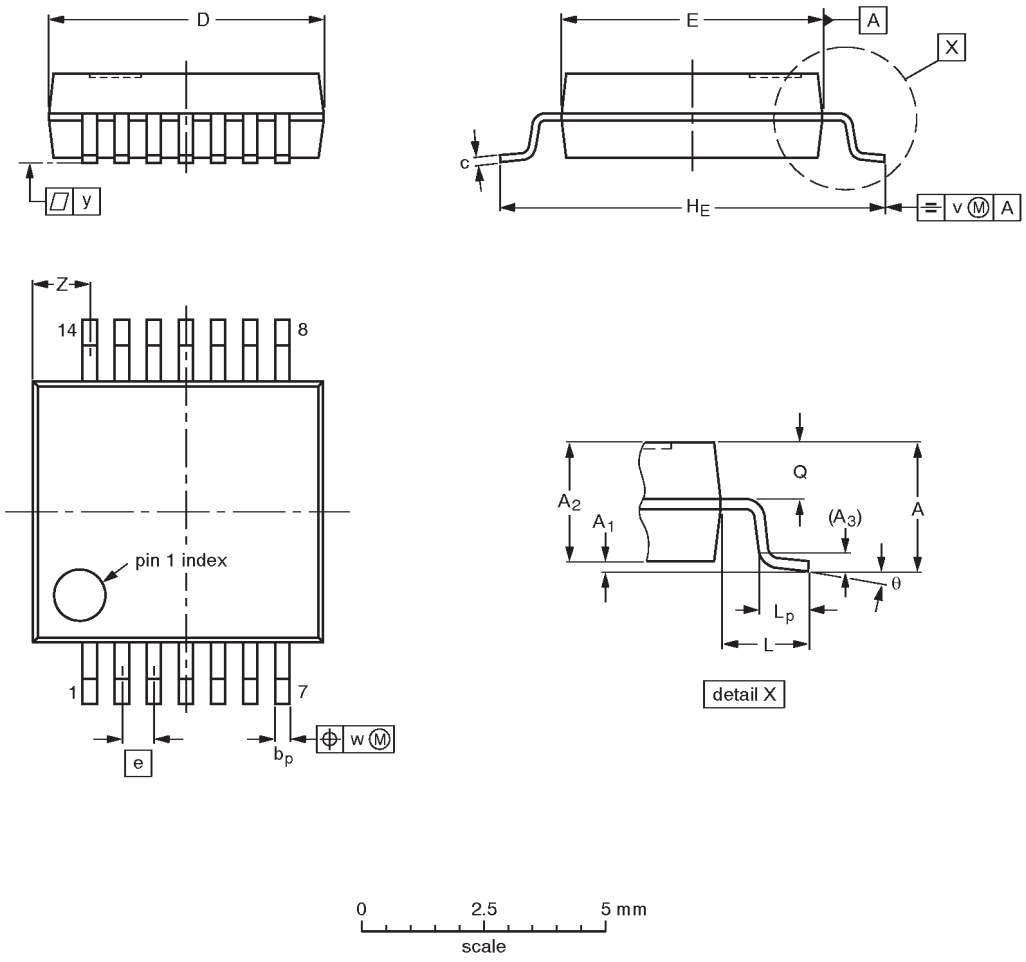
| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.75 | 0.25<br>0.10 | 1.45<br>1.25 | 0.25 | 0.49<br>0.36 | 0.25<br>0.19 | 8.75<br>8.55 | 4.0<br>3.8 | 1.27 | 6.2<br>5.8 | 1.05 | 1.0<br>0.4 | 0.7<br>0.6 | 0.25 | 0.25 | 0.1 | 0.7<br>0.3 | $8^o$<br>$0^o$ |
| inches | 0.069 | 0.010<br>0.004 | 0.057<br>0.049 | 0.01 | 0.019<br>0.014 | 0.0100<br>0.0075 | 0.35<br>0.34 | 0.16<br>0.15 | 0.050 | 0.244<br>0.228 | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012 | |

**Note**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT108-1 | 076E06S | MS-012AB | | | | ~~95-01-23~~<br>97-05-22 |

**SSOP14: plastic shrink small outline package; 14 leads; body width 5.3 mm** **SOT337-1**




**DIMENSIONS (mm are the original dimensions)**

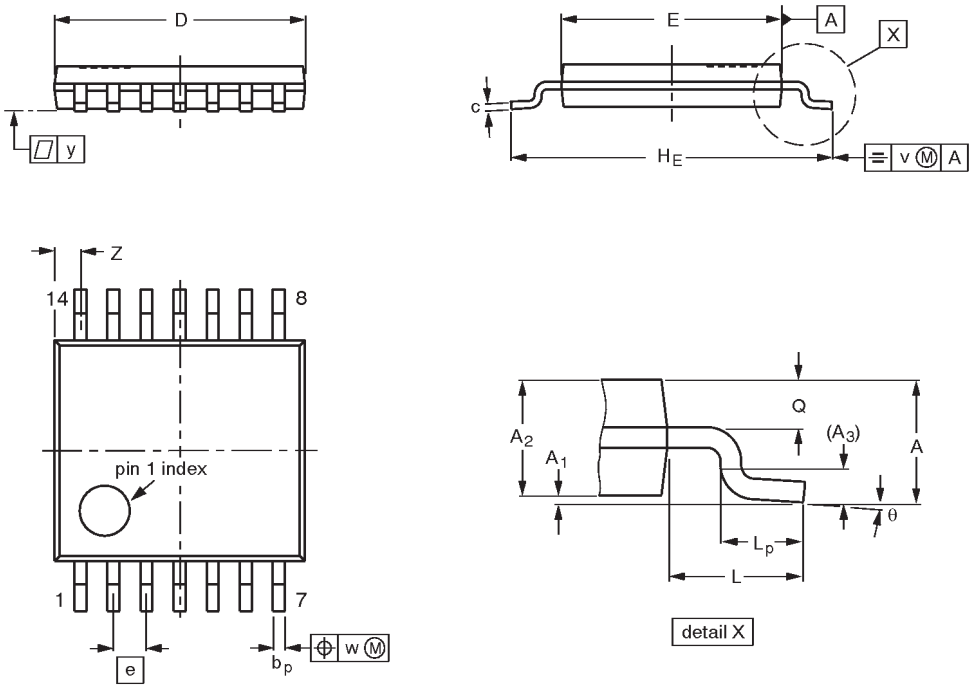
| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (1) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 2.0 | 0.21<br>0.05 | 1.80<br>1.65 | 0.25 | 0.38<br>0.25 | 0.20<br>0.09 | 6.4<br>6.0 | 5.4<br>5.2 | 0.65 | 7.9<br>7.6 | 1.25 | 1.03<br>0.63 | 0.9<br>0.7 | 0.2 | 0.13 | 0.1 | 1.4<br>0.9 | 8°<br>0° |

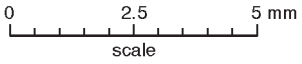
**Note**

1. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT337-1 | | MO-150AB | | | | ~~95-02-04~~<br>96-01-18 |

**TSSOP14: plastic thin shrink small outline package; 14 leads; body width 4.4 mm** **SOT402-1**




**DIMENSIONS (mm are the original dimensions)**

| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (2) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.10 | 0.15<br>0.05 | 0.95<br>0.80 | 0.25 | 0.30<br>0.19 | 0.2<br>0.1 | 5.1<br>4.9 | 4.5<br>4.3 | 0.65 | 6.6<br>6.2 | 1.0 | 0.75<br>0.50 | 0.4<br>0.3 | 0.2 | 0.13 | 0.1 | 0.72<br>0.38 | 8°<br>0° |

**Notes**

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic interlead protrusions of 0.25 mm maximum per side are not included.

| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|---|---|---|---|---|---|---|
| | IEC | JEDEC | EIAJ | | | |
| SOT402-1 | | MO-153 | | | | ~~94-07-12~~<br>95-04-04 |

**NOTES**

## DEFINITIONS

| Data Sheet Identification | Product Status | Definition |
|---|---|---|
| *Objective Specification* | Formative or in Design | This data sheet contains the design target or goal specifications for product development. Specifications may change in any manner without notice. |
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(print code) Date of release: July 1994

Document order number: 9397-750-04854

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