# Quad 2-input OR gate



**74AC32**
**74ACT32**

## FEATURES

- 74ACT32 has TTL-compatible inputs
- 74AC32 has CMOS-compatible inputs
- Meets or exceeds JEDEC standard standard for 74AC(T)XX family
- Superior ground bounce noise immunity
- Output source/sink 24mA

## DESCRIPTION

The 74AC32/74ACT32 provides the 2-input OR function.

## QUICK REFERENCE DATA

| SYMBOL | PARAMETER | CONDITIONS | TYPICAL | | | UNIT |
|---|---|---|---|---|---|---|
| | | | AC | | ACT | |
| | | | $V_{CC}$ = 3.3V | $V_{CC}$ = 5.0V | $V_{CC}$ = 5.0V | |
| $t_{PHL}/t_{PLH}$ | Propagation delay nA, nB to nY | $C_L$ = 50pF | 3.5 | 2.5 | 3.8 | ns |
| $C_I$ | Input capacitance | | 4.5 | | | pF |
| $C_{PD}$ | Power dissipation capacitance per gate | $V_I$ = GND to $V_{CC}$[1] | 26 | | 28 | pF |

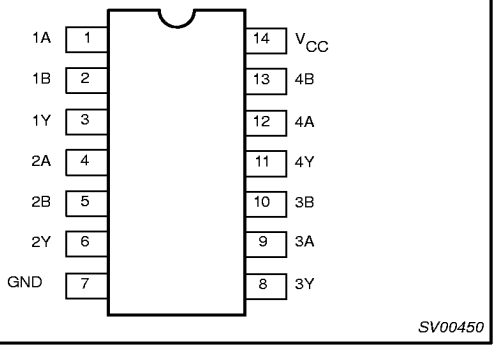
**NOTE:**

1. $C_{PD}$ is used to determine the dynamic power dissipation ($P_D$ in μW):
   $P_D = C_{PD} \times V_{CC}^2 \times f_i + \Sigma (C_L \times V_{CC}^2 \times f_o)$ where:
   $f_i$ = input frequency in MHz; $C_L$ = output load capacity in pF;
   $f_o$ = output frequency in MHz; $V_{CC}$ = supply voltage in V;
   $\Sigma (C_L \times V_{CC}^2 \times f_o)$ = sum of outputs.

## ORDERING AND PACKAGE INFORMATION

| PACKAGES | TEMPERATURE RANGE | OUTSIDE NORTH AMERICA | NORTH AMERICA | DRAWING NUMBER |
|---|---|---|---|---|
| 14-Pin Plastic SO | –40°C to +85°C | 74AC32D<br>74ACT32D | 74AC32D<br>74ACT32D | SOT108-1 |
| 14-Pin Plastic SSOP Type II | –40°C to +85°C | 74AC32DB<br>74ACT32DB | 74AC32DB<br>74ACT32DB | SOT337-1 |
| 14-Pin Plastic TSSOP Type I | –40°C to +85°C | 74AC32PW<br>74ACT32PW | 74AC32PW DH<br>74ACT32PW DH | SOT402-1 |

## PIN CONFIGURATION




## PIN DESCRIPTION

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

# Quad 2-input OR gate



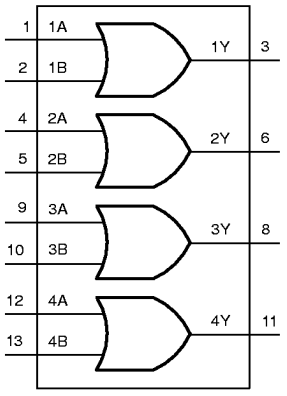
74AC32
74ACT32

## FUNCTION TABLE

| INPUTS | | OUTPUTS |
|---|---|---|
| nA | nB | nY |
| L | L | L |
| L | H | H |
| H | L | H |
| H | H | H |

**NOTES:**
H = HIGH voltage level
L = LOW voltage level

## LOGIC SYMBOL

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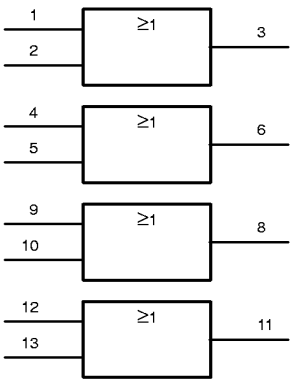
## LOGIC SYMBOL (IEEE/IEC)

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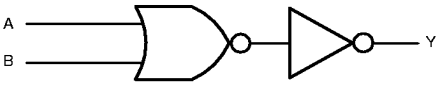
## LOGIC DIAGRAM




SV00454

## RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | MIN | MAX | |
|---|---|---|---|---|
| $V_{CC}$ | DC supply voltage for 'AC | 2.0 | 6.0 | V |
| | DC supply voltage for 'ACT | 4.5 | 5.5 | |
| $V_{IN}$ | DC input voltage range | 0 | $V_{CC}$ | V |
| $V_O$ | DC output voltage range | 0 | $V_{CC}$ | V |
| $T_{amb}$ | Operating free-air temperature range | –40 | +85 | °C |
| $\Delta V/\Delta t$ | Minimum input edge rate<br>— AC devices<br>$V_{IN}$ from 30% to 70% of $V_{CC}$<br>$V_{CC}$ @ 3.3V, 4.5V, 5.5V | 125 | | mV/ns |
| | — ACT devices<br>$V_{IN}$ from 0.8V to 2.0V<br>$V_{CC}$ @ 4.5V, 5.5V | 125 | | |

## ABSOLUTE MAXIMUM RATINGS[1]

in accordance with the Absolute Maximum Rating System (IEC134)
Voltages are referenced to GND (ground = 0V)

| SYMBOL | PARAMETER | CONDITIONS | RATING | UNIT |
|---|---|---|---|---|
| $V_{CC}$ | DC supply voltage | | –0.5 to +7.0 | V |
| $I_{IK}$ | DC input diode current | $V_{IN}$ = –0.5V | –20 | mA |
| | | $V_{IN}$ = $V_{CC}$ + 0.5V | +20 | |
| $V_{IN}$ | DC input voltage | | –0.5 to $V_{CC}$ +0.5 | V |
| $I_{OK}$ | DC output diode current | $V_O$ = –0.5V | –20 | mA |
| | | $V_O$ = $V_{CC}$ + 0.5V | +20 | |
| $V_O$ | DC output voltage | | –0.5 to $V_{CC}$ +0.5 | V |
| $I_O$ | DC output source or sink current | | ±50 | mA |
| $I_{CC}$, $I_{GND}$ | DC $V_{CC}$ or GND current per output | | ±50 | mA |
| | DC $V_{CC}$ or GND current | | ±200 | |
| $T_{stg}$ | Storage temperature range | | –65 to +150 | °C |
| $P_{TOT}$ | Power dissipation per package<br>– plastic mini-pack (SO)<br>– plastic shrink mini-pack (SSOP and TSSOP) | <br>above +70°C derate linearly with 8 mW/K<br>above +60°C derate linearly with 5.5 mW/K | <br>500<br>500 | mW |

**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.

## DC CHARACTERISTICS FOR THE AC FAMILY

Over recommended operating conditions voltages are referenced to GND (ground = 0V)

| SYMBOL | PARAMETER | TEST CONDITIONS | $V_{CC}$ (V) | LIMITS | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | Temp = -40°C to +85°C | | | |
| | | | | MIN | TYP | MAX | |
| $V_{IH}$ | HIGH level Input voltage | $V_{OUT}$ = 0.1V or ($V_{CC}$ – 0.1V) | 3.0 | 2.1 | 1.5 | | V |
| | | | 4.5 | 3.15 | 2.25 | | |
| | | | 5.5 | 3.85 | 2.75 | | |
| $V_{IL}$ | LOW level Input voltage | $V_{OUT}$ = 0.1V or ($V_{CC}$ – 0.1V) | 3.0 | | 1.5 | 0.9 | V |
| | | | 4.5 | | 2.25 | 1.35 | |
| | | | 5.5 | | 2.75 | 1.65 | |
| $V_{OH}$ | HIGH level output voltage | $I_{OUT}$ = –50 μA | 3.0 | 2.9 | 2.99 | | V |
| | | | 4.5 | 4.4 | 4.49 | | |
| | | | 5.5 | 5.4 | 5.49 | | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = –12mA[1] | 3.0 | 2.46 | | | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = –24mA[1] | 4.5 | 3.76 | | | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = –24mA[1] | 5.5 | 4.76 | | | |
| $V_{OL}$ | LOW level output voltage | $I_{OUT}$ = 50 μA | 3.0 | | 0.01 | 0.1 | V |
| | | | 4.5 | | 0.01 | 0.1 | |
| | | | 5.5 | | 0.01 | 0.1 | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 12mA[1] | 3.0 | | | 0.44 | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 24mA[1] | 4.5 | | | 0.44 | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 24mA[1] | 5.5 | | | 0.44 | |
| $I_{IN}$ | Input leakage current | $V_{IN}$ = $V_{CC}$, GND | 5.5 | | | ±1.0 | μA |
| $I_{OLD}$ | Dynamic output current[2] | $V_{OLD}$ = 1.65V max | 5.5 | 75 | | | mA |
| $I_{OHD}$ | Dynamic output current[2] | $V_{OHD}$ = 3.85V min | 5.5 | | | –75 | mA |
| $I_{CC}$ | Quiescent supply current | $V_{IN}$ = $V_{CC}$ or GND | 5.5 | | | 40 | μA |

**NOTES:**
1. All outputs loaded
2. Maximum test duration 2.0 ms; one output loaded at a time

## DC CHARACTERISTICS FOR THE ACT FAMILY

Over recommended operating conditions voltages are referenced to GND (ground = 0V)

| SYMBOL | PARAMETER | TEST CONDITIONS | $V_{CC}$ (V) | LIMITS | | | UNIT |
|---|---|---|---|---|---|---|---|
| | | | | Temp = -40°C to +85°C | | | |
| | | | | MIN | TYP | MAX | |
| $V_{IH}$ | HIGH level Input voltage | $V_{OUT}$ = 0.1V or ($V_{CC}$ – 0.1V) | 4.5 | 2.0 | 1.5 | | V |
| | | | 5.5 | 2.0 | 1.5 | | |
| $V_{IL}$ | LOW level Input voltage | $V_{OUT}$ = 0.1V or ($V_{CC}$ – 0.1V) | 4.5 | | 1.5 | 0.8 | V |
| | | | 5.5 | | 1.5 | 0.8 | |
| $V_{OH}$ | HIGH level output voltage | $I_{OUT}$ = –50 μA | 4.5 | 4.4 | 4.49 | | V |
| | | | 5.5 | 5.4 | 5.49 | | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = –24mA[1] | 4.5 | 3.76 | | | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OH}$ = –24mA[1] | 5.5 | 4.76 | | | |
| $V_{OL}$ | LOW level output voltage | $I_{OUT}$ = 50 μA | 4.5 | | 0.01 | 0.1 | V |
| | | | 5.5 | | 0.01 | 0.1 | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 24mA[1] | 4.5 | | | 0.44 | |
| | | $V_{IN}$ = $V_{IL}$ or $V_{IH}$, $I_{OL}$ = 24mA[1] | 5.5 | | | 0.44 | |
| $I_{IN}$ | Input leakage current | $V_{IN}$ = $V_{CC}$, GND | 5.5 | | | ±1.0 | μA |
| $\Delta I_{CC}$ | Additional quiescent supply current per input pin | $V_{IN}$ = $V_{CC}$ – 2.1V<br>Other inputs at $V_{CC}$ or GND; $I_{OUT}$ = 0 | 5.5 | | | 1.5 | mA |
| $I_{OLD}$ | Dynamic output current[2] | $V_{OLD}$ = 1.65V max | 5.5 | 75 | | | mA |
| $I_{OHD}$ | Dynamic output current[2] | $V_{OHD}$ = 3.85V min | 5.5 | | | –75 | mA |
| $I_{CC}$ | Quiescent supply current | $V_{IN}$ = $V_{CC}$ or GND | 5.5 | | | 40 | μA |

**NOTES:**
1. All outputs loaded
2. Maximum test duration 2.0ms, one output loaded at a time

## AC CHARACTERISTICS FOR 74AC32

GND = 0V; $t_r = t_f \leq 2.5$ns; $C_L = 50$pF; $R_L = 500\Omega$; .

| SYMBOL | PARAMETER | $V_{CC}$[1] | LIMITS | | | | | UNIT | WAVEFORM |
|---|---|---|---|---|---|---|---|---|---|
| | | | $T_{amb}$ = +25°C | | | $T_{amb}$ = −40°C to +85°C | | | |
| | | | MIN | TYP | MAX | MIN | MAX | | |
| $t_{PLH}$ | Propagation delay nA, nB to nY | 3.3<br>5.0 | 2.0<br>1.5 | 3.6<br>2.5 | 8.0<br>5.5 | 1.5<br>1.0 | 9.0<br>6.0 | ns | 1, 2 |
| $t_{PHL}$ | Propagation delay nA, nB to nY | 3.3<br>5.0 | 2.0<br>1.5 | 3.5<br>2.6 | 8.0<br>5.5 | 1.5<br>1.0 | 9.0<br>6.0 | ns | |

**NOTE:**
1. Voltage range 3.3V is $V_{CC} = 3.3V \pm 0.3V$
   Voltage range 5.0V is $V_{CC} = 5.0V \pm 0.5V$

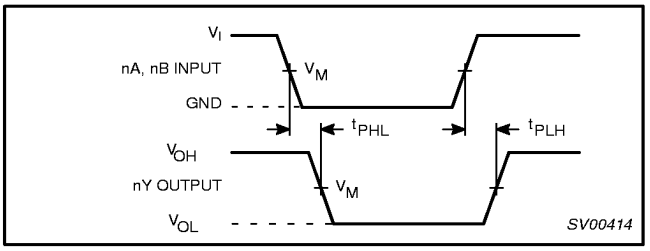
## AC CHARACTERISTICS FOR 74ACT32

GND = 0V; $t_r = t_f \leq 2.5$ns; $C_L = 50$pF; $R_L = 500\Omega$; .

| SYMBOL | PARAMETER | $V_{CC}$[1] | LIMITS | | | | | UNIT | WAVEFORM |
|---|---|---|---|---|---|---|---|---|---|
| | | | $T_{amb}$ = +25°C | | | $T_{amb}$ = −40°C to +85°C | | | |
| | | | MIN | TYP | MAX | MIN | MAX | | |
| $t_{PLH}$ | Propagation delay nA, nB to nY | 5.0 | 2.0 | 4.2 | 9.0 | 1.5 | 10.0 | ns | 1, 2 |
| $t_{PHL}$ | Propagation delay nA, nB to nY | 5.0 | 2.0 | 3.4 | 9.0 | 1.5 | 10.0 | ns | |

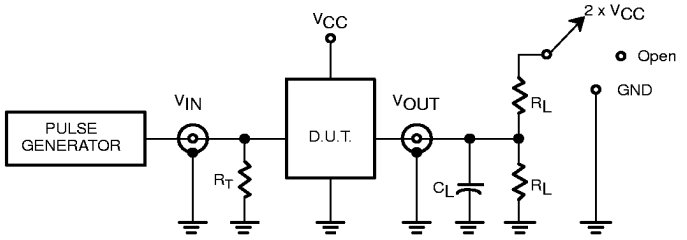
**NOTE:**
1. Voltage range 5.0V is $V_{CC} = 5.0V \pm 0.5V$

## AC WAVEFORMS




**Waveform 1. Inputs (nA, nB) to output (nY) propagation delays**

## TEST CIRCUIT




Test Circuit for 3-State Outputs

**SWITCH POSITION**

| TEST | SWITCH |
|---|---|
| $t_{PLH}/t_{PHL}$ | Open |

| FAMILY | $V_{IN}$ Input Requirements | $V_m$ Input | $V_m$ Output |
|---|---|---|---|
| AC | GND to $V_{CC}$ | 50% $V_{CC}$ | 50% $V_{CC}$ |
| ACT | GND to 3.0V | 1.5V | 50% $V_{CC}$ |

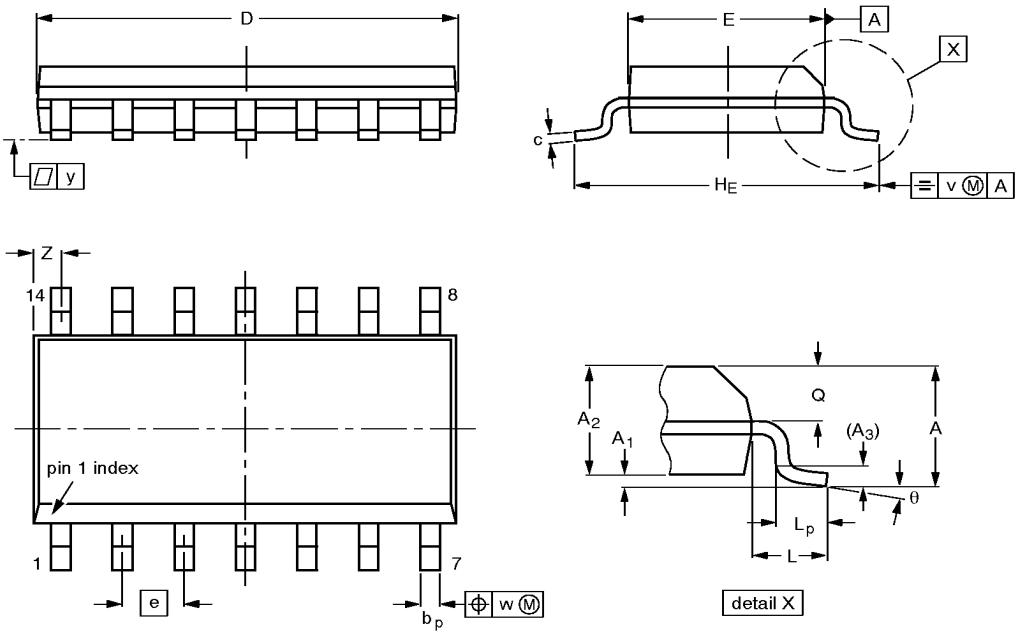
SV00802

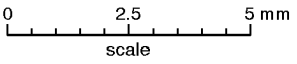
**Waveform 2. Load circuitry for switching times.**

## DEFINITIONS

$R_L$ = Load resistor; see AC Characteristics for value
$C_L$ = Load capacitance; see AC Characteristics
Termination resistance should be equal to $Z_{OUT}$ of pulse generators

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




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

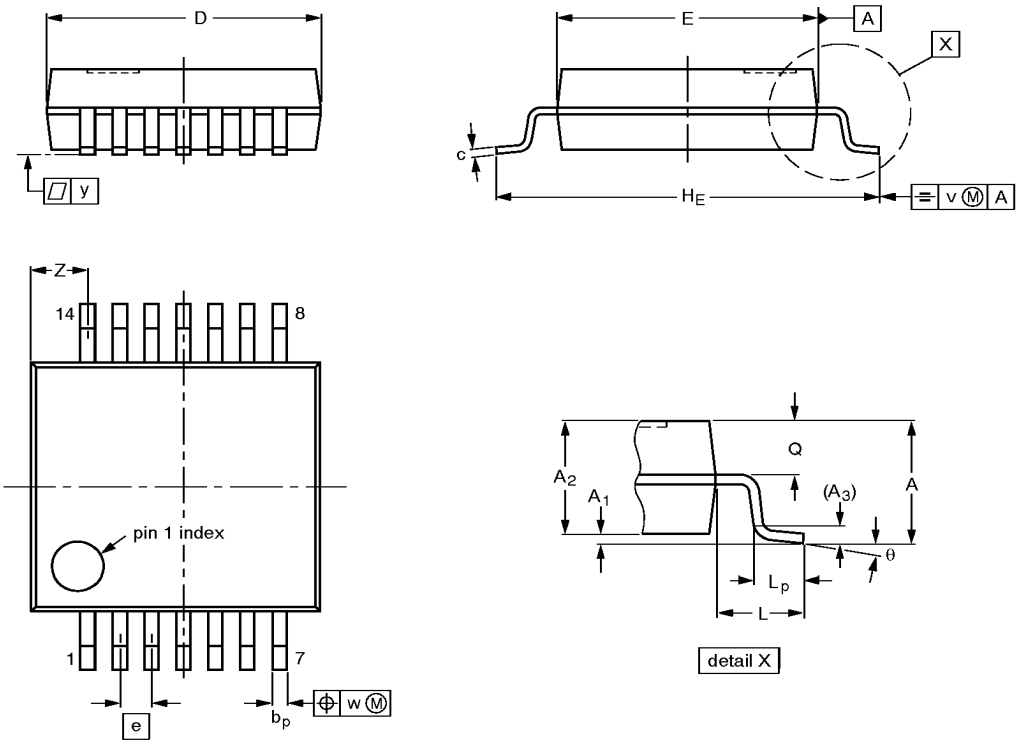
| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | $D^{(1)}$ | $E^{(1)}$ | e | $H_E$ | L | $L_p$ | Q | v | w | y | $Z^{(1)}$ | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 1.75 | 0.25<br>0.10 | 1.45<br>1.25 | 0.25 | 0.49<br>0.36 | 0.25<br>0.19 | 8.75<br>8.55 | 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°<br>0° |
| inches | 0.069 | 0.0098<br>0.0039 | 0.057<br>0.049 | 0.01 | 0.019<br>0.014 | 0.0098<br>0.0075 | 0.35<br>0.34 | 0.16<br>0.15 | 0.050 | 0.24<br>0.23 | 0.041 | 0.039<br>0.016 | 0.028<br>0.024 | 0.01 | 0.01 | 0.004 | 0.028<br>0.012 | |

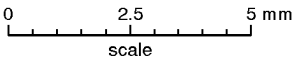
**Note**

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 | | | | ~~91-08-13~~<br>95-01-23 |

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




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

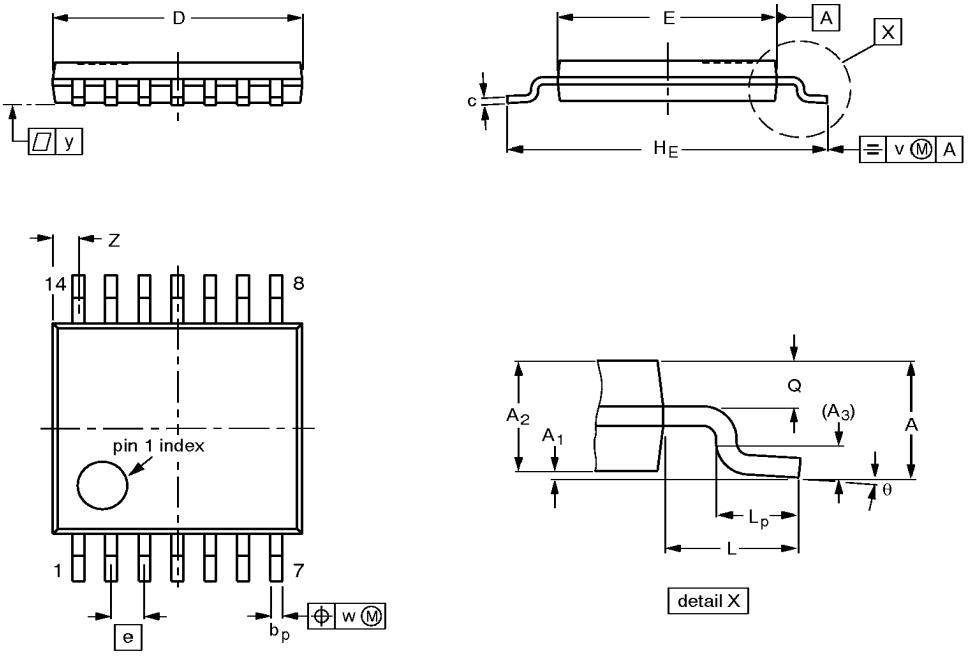
| UNIT | A max. | $A_1$ | $A_2$ | $A_3$ | $b_p$ | c | D (1) | E (1) | e | $H_E$ | L | $L_p$ | Q | v | w | y | Z (1) | θ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| mm | 2.0 | 0.21<br>0.05 | 1.80<br>1.65 | 0.25 | 0.38<br>0.25 | 0.20<br>0.09 | 6.4<br>6.0 | 5.4<br>5.2 | 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° |

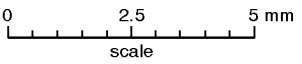
**Note**

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 |