

DATA SHEET

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74ALS257/74ALS258 Data selector/multiplexer

Product specification
IC05 Data Handbook

1991 Feb 08

Data selector/multiplexer

74ALS257/74ALS258

74ALS257 Quad 2-input data selector, non-inverting (3-State)

74ALS258 Quad 2-input data selector, inverting (3-State)

DESCRIPTION

The 74ALS257 is a quad 2-input multiplexer which selects 4 bits of data from one of two sources under the control of a common select input (S). The output enable input (\overline{OE}) is active when Low. When \overline{OE} is High, all of the outputs (Y_n) are forced to a High impedance state (3-State) regardless of all other input conditions.

Moving data from two registers to a common output bus is a typical use of the 74ALS257. The state of the select input determines the particular register from which data comes.

The device is the logic implementation of 4-pole, 2-position switch where the position of the switch is determined by the logic levels supplied to the select input. The 74ALS258 is similar but has inverting outputs (\overline{Y}_n).

| TYPE | TYPICAL PROPAGATION DELAY | TYPICAL SUPPLY CURRENT (TOTAL) |
|----------|---------------------------|--------------------------------|
| 74ALS257 | 7.0ns | 7mA |
| 74ALS258 | 7.0ns | 7mA |

ORDERING INFORMATION

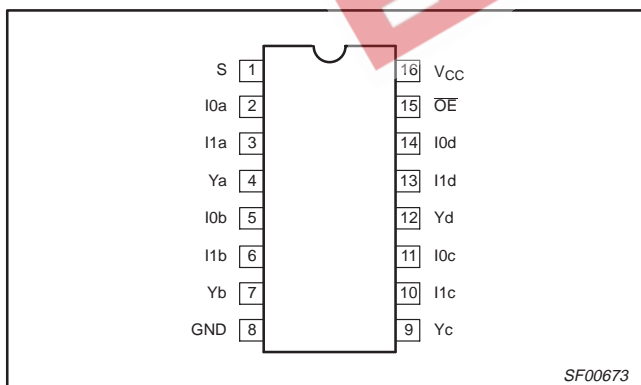
| DESCRIPTION | ORDER CODE | DRAWING NUMBER |
|-----------------------------|---|----------------|
| | COMMERCIAL RANGE $V_{CC} = 5V \pm 10\%$, $T_{amb} = 0^\circ C \text{ to } +70^\circ C$ | |
| 16-pin plastic DIP | 74ALS257N, 74ALS258 | SOT38-4 |
| 16-pin plastic SO | 74ALS257D, 74ALS258D | SOT109-1 |
| 16-pin plastic SSOP Type II | 74ALS257DB, 74ALS258DB | SOT338-1 |

INPUT AND OUTPUT LOADING AND FAN-OUT TABLE

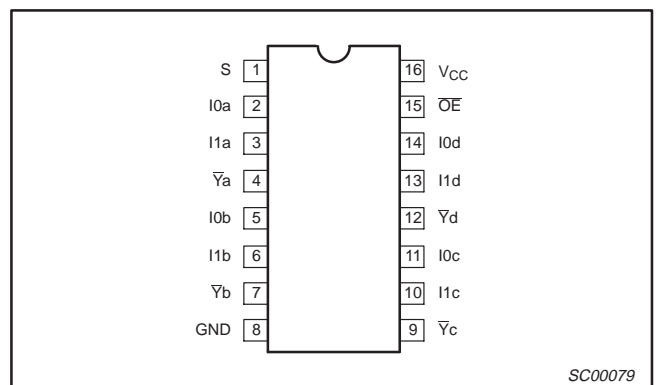
| PINS | DESCRIPTION | 74ALS (U.L.) HIGH/LOW | LOAD VALUE HIGH/LOW |
|---|--------------|-----------------------|---------------------|
| I _{1a} , I _{1b} , I _{1c} , I _{1d} | Data inputs | 1.0/1.0 | 20 μ A/0.1mA |
| S | Select input | 1.0/1.0 | 20 μ A/0.1mA |
| \overline{OE} | Enable input | 1.0/1.0 | 20 μ A/0.1mA |
| Y _a – Y _d , \overline{Y}_a – \overline{Y}_d | Data outputs | 20/240 | 0.4mA/24mA |

NOTE: One (1.0) ALS unit load is defined as: 20 μ A in the High state and 0.1mA in the Low state.

PIN CONFIGURATION – 74ALS257



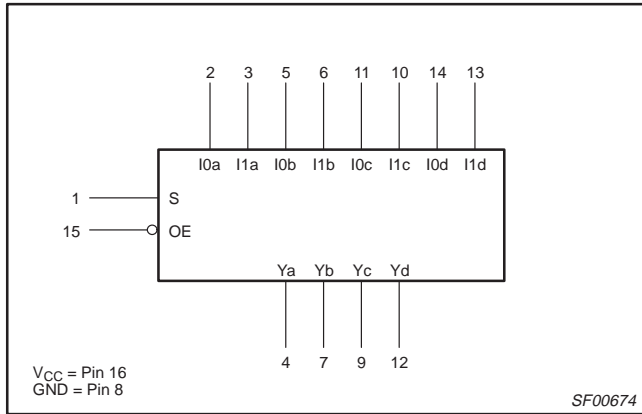
PIN CONFIGURATION – 74ALS258



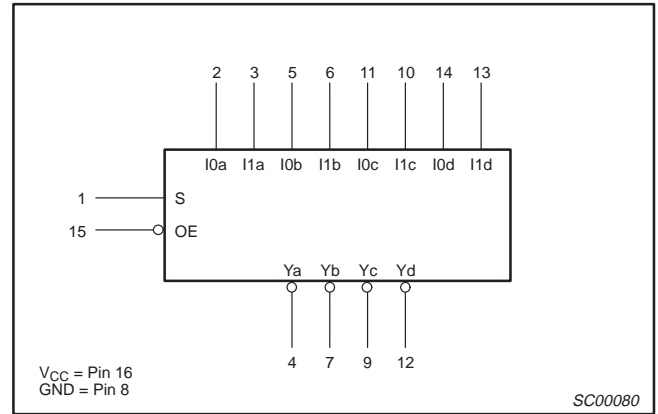
Data selector/multiplexer

74ALS257/74ALS258

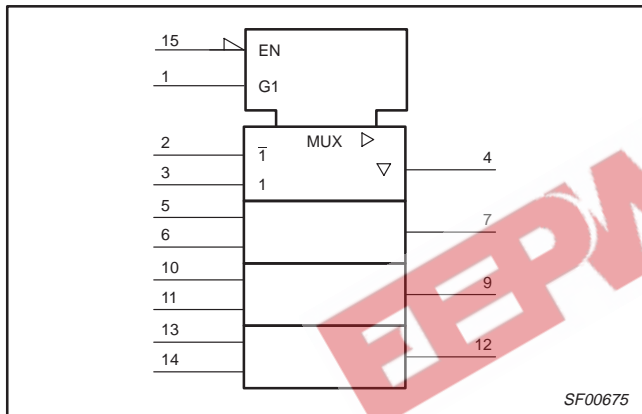
LOGIC SYMBOL – 74ALS257



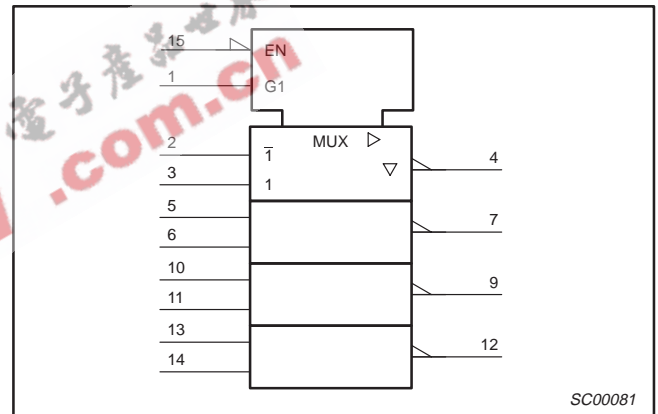
LOGIC SYMBOL – 74ALS258



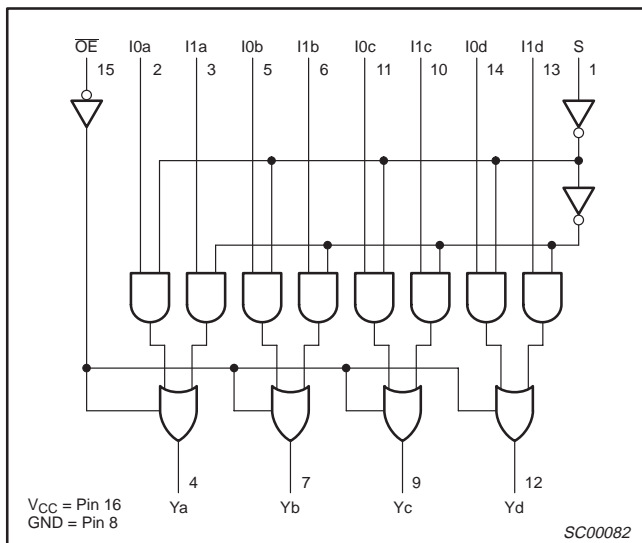
IEC/IEEE SYMBOL – 74ALS257



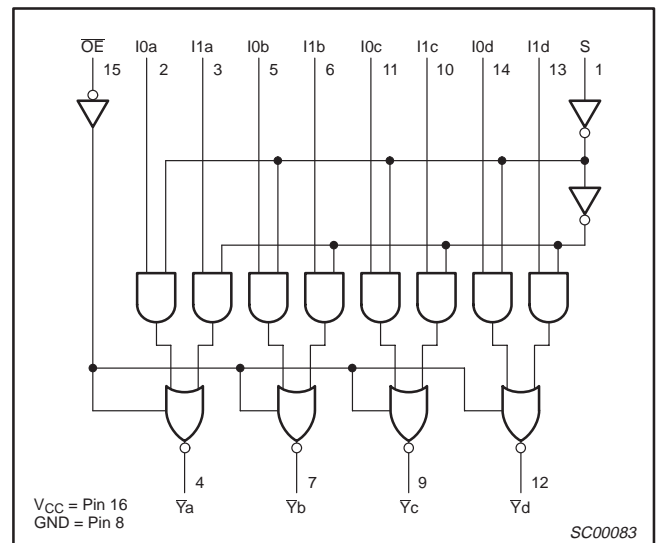
IEC/IEEE SYMBOL – 74ALS258



LOGIC DIAGRAM – 74ALS257



LOGIC DIAGRAM – 74ALS258



Data selector/multiplexer

74ALS257/74ALS258

FUNCTION TABLE – 74ALS257

| INPUTS | | | | OUTPUT |
|-----------------|---|-----|-----|--------|
| \overline{OE} | S | I0n | I1n | Yn |
| H | X | X | X | Z |
| L | L | L | X | L |
| L | L | H | X | H |
| L | H | X | L | L |
| L | H | X | H | H |

H = High voltage level
 L = Low voltage level
 X = Don't care
 Z = High impedance "off" state

FUNCTION TABLE – 74ALS258

| INPUTS | | | | OUTPUT |
|-----------------|---|-----|-----|-----------------|
| \overline{OE} | S | I0n | I1n | \overline{Yn} |
| H | X | X | X | Z |
| L | L | L | X | H |
| L | L | H | X | L |
| L | H | X | L | H |
| L | H | X | H | L |

H = High voltage level
 L = Low voltage level
 X = Don't care
 Z = High impedance "off" state

ABSOLUTE MAXIMUM RATINGS

(Operation beyond the limit set forth in this table may impair the useful life of the device.
 Unless otherwise noted these limits are over the operating free air temperature range.)

| SYMBOL | PARAMETER | RATING | UNIT |
|-----------|--|------------------|------|
| V_{CC} | Supply voltage | -0.5 to +7.0 | V |
| V_{IN} | Input voltage | -0.5 to +7.0 | V |
| I_{IN} | Input current | -30 to +5 | mA |
| V_{OUT} | Voltage applied to output in High output state | -0.5 to V_{CC} | V |
| I_{OUT} | Current applied to output in Low output state | 48 | mA |
| T_{amb} | Operating free-air temperature range | 0 to +70 | °C |
| T_{stg} | Storage temperature range | -65 to +150 | °C |

RECOMMENDED OPERATING CONDITIONS

| SYMBOL | PARAMETER | LIMITS | | | UNIT |
|-----------|--------------------------------------|--------|-----|------|------|
| | | MIN | NOM | MAX | |
| V_{CC} | Supply voltage | 4.5 | 5.0 | 5.5 | V |
| V_{IH} | High-level input voltage | 2.0 | | | V |
| V_{IL} | Low-level input voltage | | | 0.8 | V |
| I_{IK} | Input clamp current | | | -18 | mA |
| I_{OH} | High-level output current | | | -2.6 | mA |
| I_{OL} | Low-level output current | | | 24 | mA |
| T_{amb} | Operating free-air temperature range | 0 | | +70 | °C |

Data selector/multiplexer

74ALS257/74ALS258

DC ELECTRICAL CHARACTERISTICS

(Over recommended operating free-air temperature range unless otherwise noted.)

| SYMBOL | PARAMETER | | TEST CONDITIONS ¹ | | LIMITS | | | UNIT | |
|------------------|---|--|---|--------------------------|---------------------|------------------|------|------|----|
| | | | | | MIN | TYP ² | MAX | | |
| V _{OH} | High-level output voltage | | V _{CC} = ±10%, V _{IL} = MAX, V _{IH} = MIN | I _{OH} = -0.4mA | V _{CC} - 2 | | | V | |
| | | | | I _{OH} = MAX | 2.4 | 3.2 | | V | |
| V _{OL} | Low-level output voltage | | V _{CC} = MIN, V _{IL} = MAX, V _{IH} = MIN | I _{OL} = 12mA | | 0.25 | 0.40 | V | |
| | | | | I _{OL} = 24mA | | 0.35 | 0.50 | V | |
| V _{IK} | Input clamp voltage | | V _{CC} = MIN, I _I = I _{IK} | | | -0.73 | -1.5 | V | |
| I _I | Input current at maximum input voltage | | V _{CC} = MAX, V _I = 7.0V | | | | 0.1 | mA | |
| I _{IH} | High-level input current | | V _{CC} = MAX, V _I = 2.7V | | | | 20 | μA | |
| I _{IL} | Low-level input current | | V _{CC} = MAX, V _I = 0.4V | | | | -0.1 | mA | |
| I _{OZH} | Off-state output current, High-level voltage applied | | V _{CC} = MAX, V _I = 2.7V | | | | 20 | μA | |
| I _{OZL} | Off-state output current, Low-level voltage applied | | V _{CC} = MAX, V _I = 0.4V | | | | -20 | μA | |
| I _O | Output current ³ | | V _{CC} = MAX, V _O = 2.25V | | -30 | | -112 | mA | |
| I _{CC} | Supply current (total) | | 74ALS257 | V _{CC} = MAX | I _{CC} H | | 3 | 6 | mA |
| | | | | | I _{CC} L | | 8 | 12 | mA |
| | | | | | I _{CC} Z | | 9 | 14 | mA |
| | | | 74ALS258 | | I _{CC} H | | 2.5 | 4 | mA |
| | | | | | I _{CC} L | | 7 | 11 | mA |
| | | | | | I _{CC} Z | | 9 | 13 | mA |

NOTES:

- For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions for the applicable type.
- All typical values are at V_{CC} = 5V, T_{amb} = 25°C.
- The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current, I_{OS}.

Data selector/multiplexer

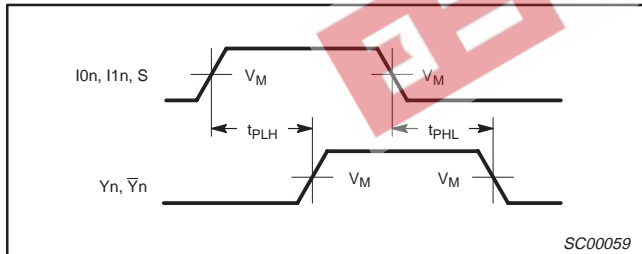
74ALS257/74ALS258

AC ELECTRICAL CHARACTERISTICS

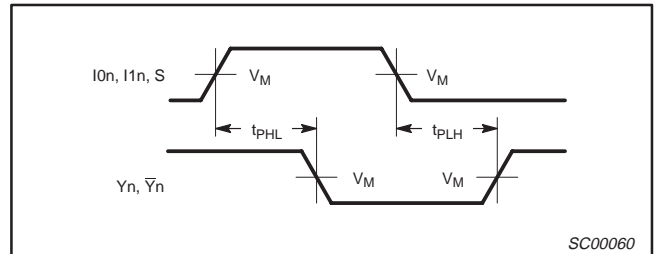
| SYMBOL | PARAMETER | TEST CONDITION | LIMITS | | UNIT |
|------------------------|---|--------------------------|---|--------------|------|
| | | | $T_{amb} = 0^{\circ}\text{C to } +70^{\circ}\text{C}$ $V_{CC} = +5.0\text{V} \pm 10\%$ $C_L = 50\text{pF}, R_L = 500\Omega$ | | |
| | | | MIN | MAX | |
| t_{PLH} t_{PHL} | Propagation delay I0n or I1n to Yn | Waveform 1 | 2.0 2.0 | 9.0 9.0 | ns |
| t_{PLH} t_{PHL} | Propagation delay S to Yn | Waveform 1, 2 | 4.0 4.0 | 12.0 12.0 | ns |
| t_{PZH} t_{PZL} | Output enable time \overline{OE} to Yn | Waveform 3 Waveform 4 | 3.0 4.0 | 11.0 12.0 | ns |
| t_{PHZ} t_{PLZ} | Output disable time \overline{OE} to Yn | Waveform 3 Waveform 4 | 2.0 5.0 | 9.0 12.0 | ns |
| t_{PLH} t_{PHL} | Propagation delay I0n or I1n to \overline{Yn} | Waveform 1 | 2.0 2.0 | 8.0 8.0 | ns |
| t_{PLH} t_{PHL} | Propagation delay S to \overline{Yn} | Waveform 1, 2 | 4.0 4.0 | 12.0 12.0 | ns |
| t_{PZH} t_{PZL} | Output enable time \overline{OE} to \overline{Yn} | Waveform 3 Waveform 4 | 3.0 4.0 | 11.0 12.0 | ns |
| t_{PHZ} t_{PLZ} | Output disable time \overline{OE} to \overline{Yn} | Waveform 3 Waveform 4 | 2.0 5.0 | 9.0 12.0 | ns |

AC WAVEFORMS

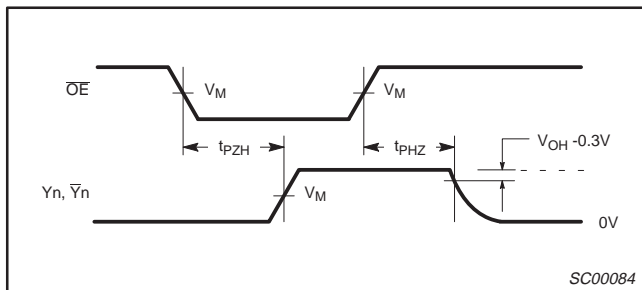
For all waveforms, $V_M = 1.3\text{V}$.



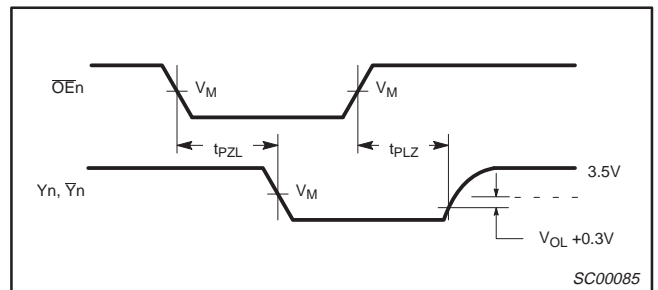
Waveform 1. Propagation Delay for Data and Select to Outputs



Waveform 2. Propagation Delay for Data and Select to Outputs



Waveform 3. 3-State Output Enable Time to High Level and Output Disable Time from High Level



Waveform 4. 3-State Output Enable Time to Low Level and Output Disable Time from Low Level

Data selector/multiplexer

74ALS257/74ALS258

TEST CIRCUIT AND WAVEFORMS

Test Circuit for 3-State Outputs

The test circuit consists of a PULSE GENERATOR connected to the input V_{IN} of a D.U.T. (Device Under Test). The input line is terminated with a resistor R_T . The output V_{OUT} is connected to a load resistor R_L and a load capacitor C_L . The D.U.T. is powered by V_{CC} . A switch is connected to the output line, which can be set to 7.0V.

SWITCH POSITION

| TEST | SWITCH |
|-----------------------|--------|
| t_{PLZ} , t_{PZL} | closed |
| All other | open |

DEFINITIONS:
 R_L = Load resistor; see AC electrical characteristics for value.
 C_L = Load capacitance includes jig and probe capacitance; see AC electrical characteristics for value.
 R_T = Termination resistance should be equal to Z_{OUT} of pulse generators.

Input Pulse Definition

The waveforms show the timing parameters for negative and positive pulses. The negative pulse starts at 90% of V_M and falls to 10% over a time $t_{TLH}(t_r)$. The pulse width is t_w . The positive pulse starts at 10% of V_M and rises to 90% over a time $t_{TLH}(t_r)$. The pulse width is t_w . The fall time is $t_{THL}(t_f)$. The voltage levels are V_M and 0.3V.

INPUT PULSE REQUIREMENTS

| Family | INPUT PULSE REQUIREMENTS | | | | | |
|--------|--------------------------|-------|----------|-------|-----------|-----------|
| | Amplitude | V_M | Rep.Rate | t_w | t_{TLH} | t_{THL} |
| 74ALS | 3.5V | 1.3V | 1MHz | 500ns | 2.0ns | 2.0ns |

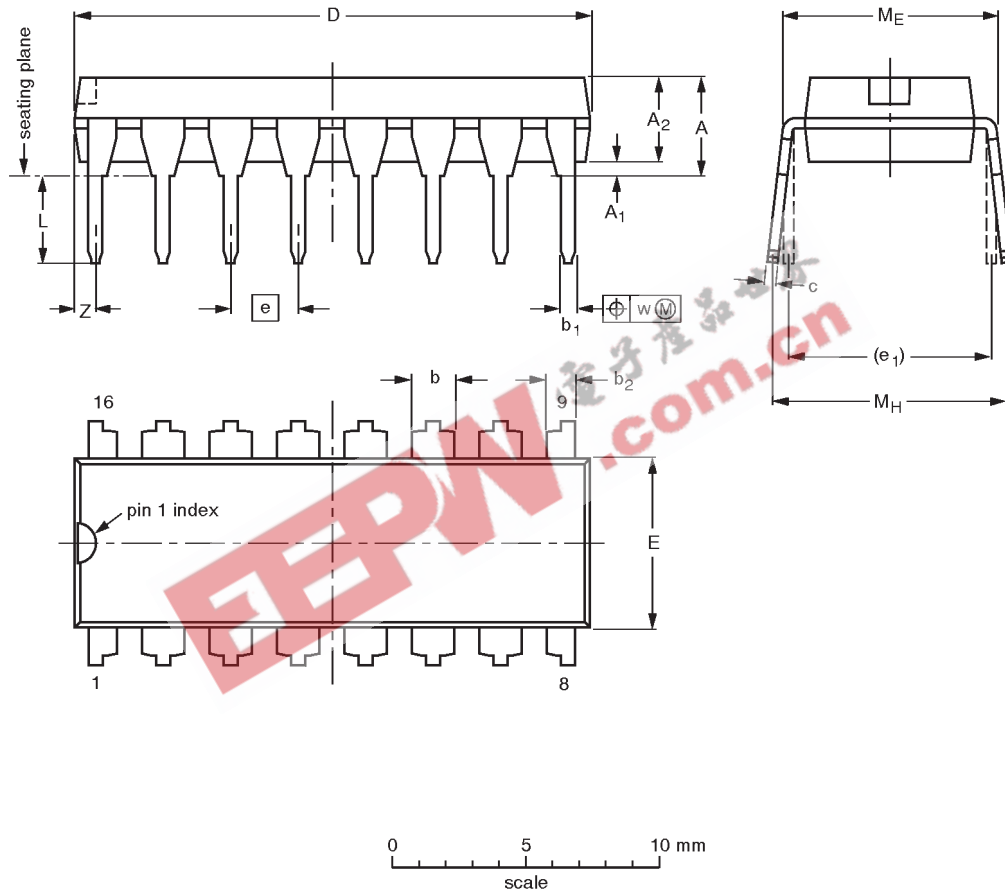
SC00072

Data selector/multiplexer

74ALS257/74ALS258

DIP16: plastic dual in-line package; 16 leads (300 mil)

SOT38-4



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

| UNIT | A max. | A ₁ min. | A ₂ max. | b | b ₁ | b ₂ | 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 1.30 | 0.53 0.38 | 1.25 0.85 | 0.36 0.23 | 19.50 18.55 | 6.48 6.20 | 2.54 | 7.62 | 3.60 3.05 | 8.25 7.80 | 10.0 8.3 | 0.254 | 0.76 |
| inches | 0.17 | 0.020 | 0.13 | 0.068 0.051 | 0.021 0.015 | 0.049 0.033 | 0.014 0.009 | 0.77 0.73 | 0.26 0.24 | 0.10 | 0.30 | 0.14 0.12 | 0.32 0.31 | 0.39 0.33 | 0.01 | 0.030 |

Note

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

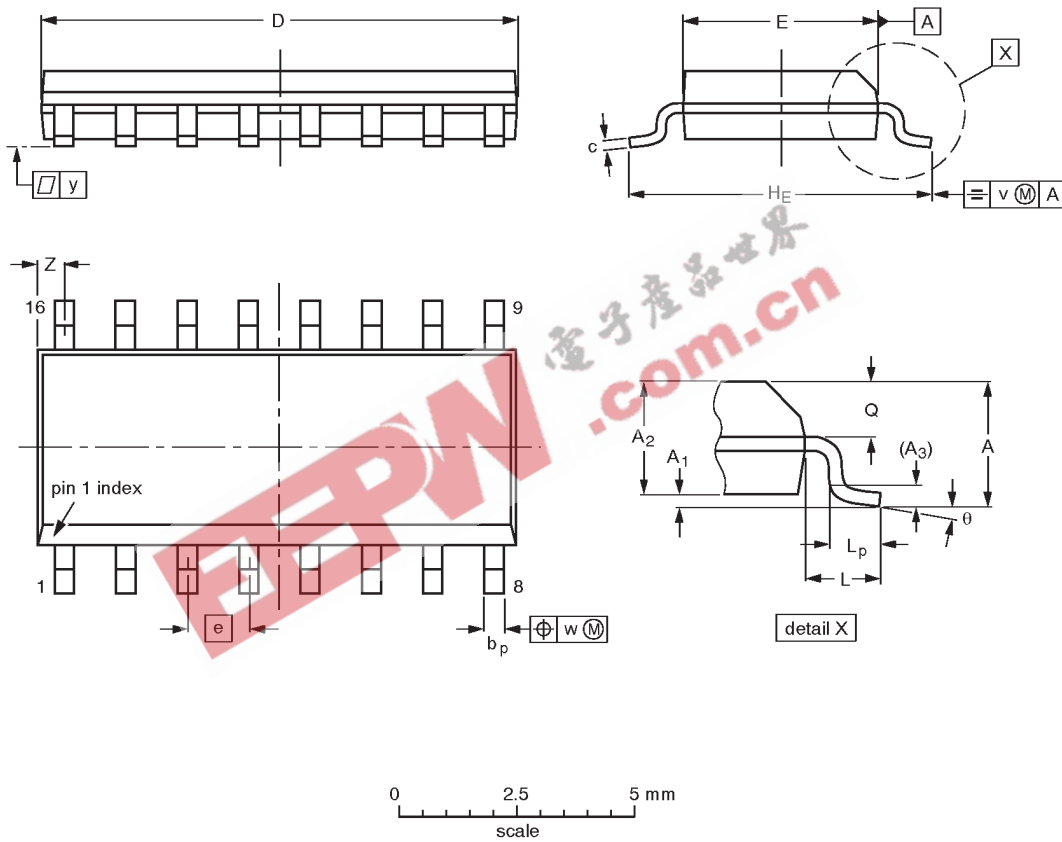
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|-------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT38-4 | | | | | | 92-11-17 95-01-14 |

Data selector/multiplexer

74ALS257/74ALS258

SO16: plastic small outline package; 16 leads; body width 3.9 mm

SOT109-1



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 0.10 | 1.45 1.25 | 0.25 | 0.49 0.36 | 0.25 0.19 | 10.0 9.8 | 4.0 3.8 | 1.27 | 6.2 5.8 | 1.05 | 1.0 0.4 | 0.7 0.6 | 0.25 | 0.25 | 0.1 | 0.7 0.3 | 8° 0° |
| inches | 0.069 | 0.0098 0.0039 | 0.057 0.049 | 0.01 | 0.019 0.014 | 0.0098 0.0075 | 0.39 0.38 | 0.16 0.15 | 0.050 | 0.24 0.23 | 0.041 | 0.039 0.016 | 0.028 0.020 | 0.01 | 0.01 | 0.004 | 0.028 0.012 | |

Note

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

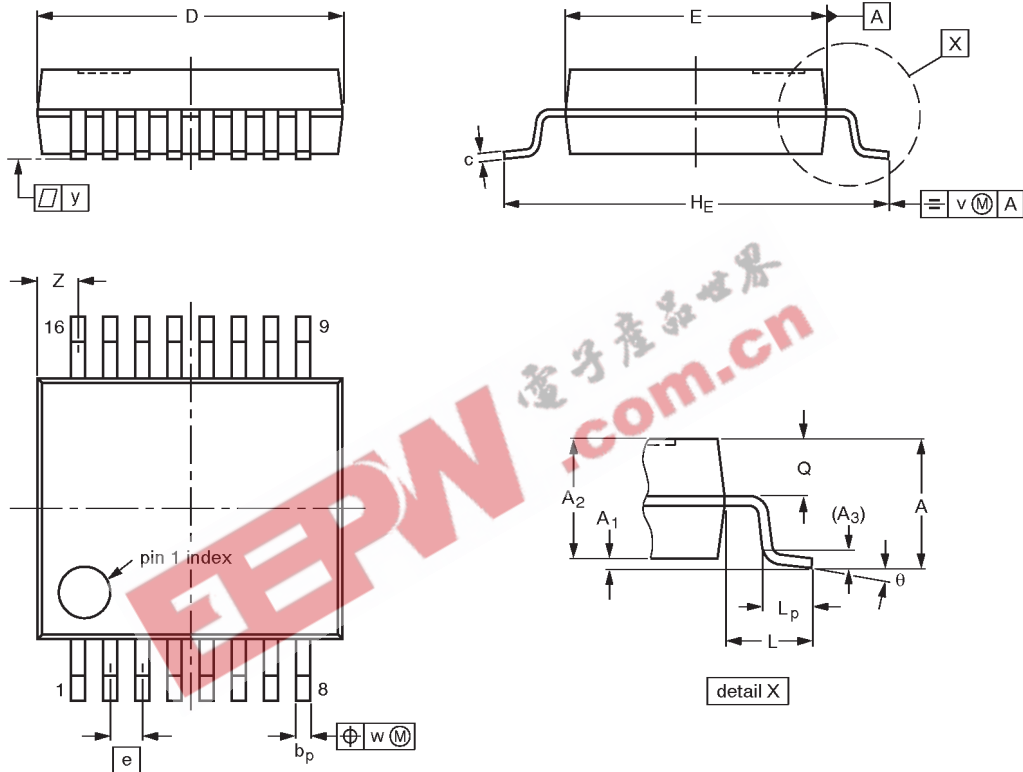
| OUTLINE VERSION | REFERENCES | | | | EUROPEAN PROJECTION | ISSUE DATE |
|-----------------|------------|----------|------|--|---------------------|----------------------|
| | IEC | JEDEC | EIAJ | | | |
| SOT109-1 | 076E07S | MS-012AC | | | | 91-08-13 95-01-23 |

Data selector/multiplexer

74ALS257/74ALS258

SSOP16: plastic shrink small outline package; 16 leads; body width 5.3 mm

SOT338-1



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 0.05 | 1.80 1.65 | 0.25 | 0.38 0.25 | 0.20 0.09 | 6.4 6.0 | 5.4 5.2 | 0.65 | 7.9 7.6 | 1.25 | 1.03 0.63 | 0.9 0.7 | 0.2 | 0.13 | 0.1 | 1.00 0.55 | 8° 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 | | | |
| SOT338-1 | | MO-150AC | | | | 94-01-14 95-02-04 |

Data selector/multiplexer

74ALS257/74ALS258

DEFINITIONS

| Data Sheet Identification | Product Status | Definition |
|----------------------------------|-------------------------------|--|
| <i>Objective Specification</i> | 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. |
| <i>Preliminary Specification</i> | Preproduction Product | This data sheet contains preliminary data, and supplementary data will be published at a later date. Philips Semiconductors reserves the right to make changes at any time without notice in order to improve design and supply the best possible product. |
| <i>Product Specification</i> | Full Production | This data sheet contains Final Specifications. Philips Semiconductors reserves the right to make changes at any time without notice, in order to improve design and supply the best possible product. |

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