

# SN54ALS646, SN54ALS648, SN54AS646 SN74ALS646A, SN74ALS648A, SN74AS646, SN74AS648 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

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- Independent Registers for A and B Buses
- Multiplexed Real-Time and Stored Data
- Choice of True or Inverting Data Paths
- Choice of 3-State or Open-Collector Outputs
- Package Options Include Plastic Small-Outline (DW) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (NT) and Ceramic (JT) 300-mil DIPs

| DEVICE                             | OUTPUT  | LOGIC     |
|------------------------------------|---------|-----------|
| SN54ALS646, SN74ALS646A, 'AS646    | 3 state | True      |
| SN54ALS648, SN74ALS648A, SN74AS648 | 3 state | Inverting |

## description

These devices consist of bus-transceiver circuits with 3-state or open-collector outputs, D-type flip-flops, and control circuitry arranged for multiplexed transmission of data directly from the data bus or from the internal storage registers. Data on the A or B bus is clocked into the registers on the low-to-high transition of the appropriate clock (CLKAB or CLKBA) input. Figure 1 illustrates the four fundamental bus-management functions that can be performed with the octal bus transceivers and registers.

Output-enable ( $\overline{OE}$ ) and direction-control (DIR) inputs control the transceiver functions. In the transceiver mode, data present at the high-impedance port may be stored in either or both registers.

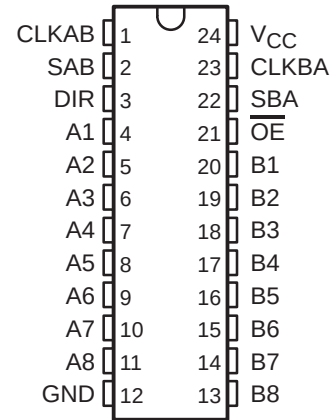
The select-control (SAB and SBA) inputs can multiplex stored and real-time (transparent mode) data. The circuitry used for select control eliminates the typical decoding glitch that occurs in a multiplexer during the transition between stored and real-time data. DIR determines which bus receives data when  $\overline{OE}$  is low. In the isolation mode ( $\overline{OE}$  high), A data may be stored in one register and/or B data may be stored in the other register.

When an output function is disabled, the input function is still enabled and can be used to store and transmit data. Only one of the two buses, A or B, may be driven at a time.

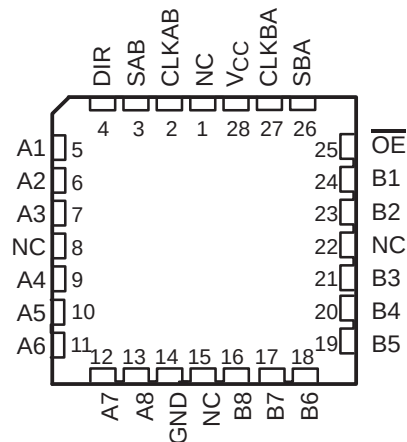
The -1 version of the SN74ALS646A is identical to the standard version, except that the recommended maximum  $I_{OL}$  in the -1 version is increased to 48 mA. There are no -1 versions of the SN54ALS646, SN54ALS648, or SN74ALS648A.

The SN54ALS646, SN54ALS648, and SN54AS646 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS646A, SN74ALS648A, SN74AS646, and SN74AS648 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

SN54ALS646, SN54ALS648, SN54AS646 . . . JT PACKAGE  
SN74ALS646A, SN74ALS648A, SN74AS646,  
SN74AS648 . . . DW OR NT PACKAGE  
(TOP VIEW)



SN54ALS646, SN54ALS648, SN54AS646 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

SN54ALS646, SN54ALS648, SN54AS646  
 SN74ALS646A, SN74ALS648A, SN74AS646, SN74AS648  
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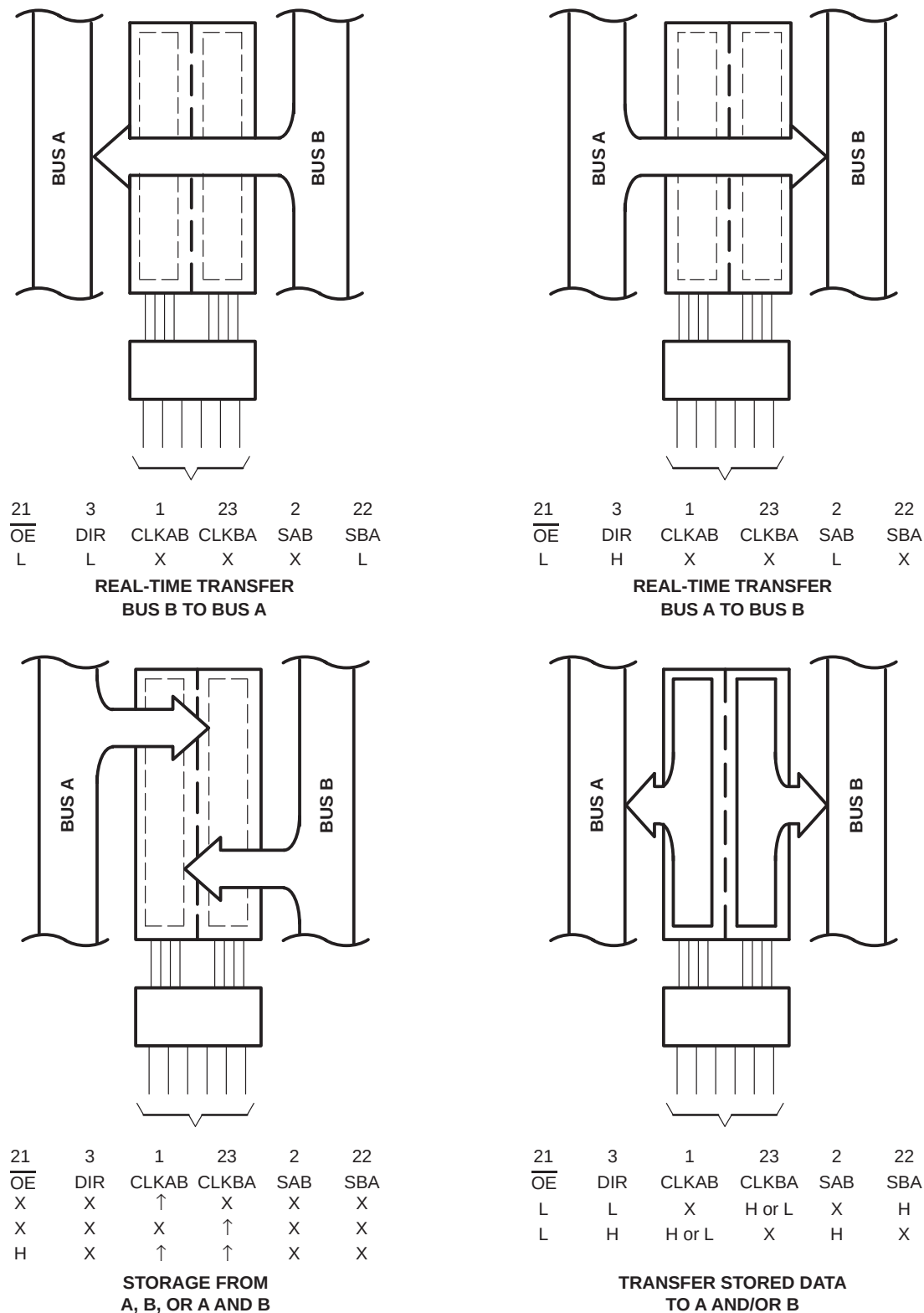


Figure 1. Bus-Management Functions

Pin numbers shown are for the DW, JT, and NT packages.

SN54ALS646, SN54ALS648, SN54AS646  
SN74ALS646A, SN74ALS648A, SN74AS646, SN74AS648  
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**Function Tables**

SN54ALS646, SN54AS646, SN74ALS646A, SN74AS646

| INPUTS          |     |        |        |     |     | DATA I/O                 |                          | OPERATION OR FUNCTION               |
|-----------------|-----|--------|--------|-----|-----|--------------------------|--------------------------|-------------------------------------|
| $\overline{OE}$ | DIR | CLKAB  | CLKBA  | SAB | SBA | A1–A8                    | B1–B8                    |                                     |
| X               | X   | ↑      | X      | X   | X   | Input                    | Unspecified <sup>†</sup> | Store A, B unspecified <sup>†</sup> |
| X               | X   | X      | ↑      | X   | X   | Unspecified <sup>†</sup> | Input                    | Store B, A unspecified <sup>†</sup> |
| H               | X   | ↑      | ↑      | X   | X   | Input                    | Input                    | Store A and B data                  |
| H               | X   | H or L | H or L | X   | X   | Input disabled           | Input disabled           | Isolation, hold storage             |
| L               | L   | X      | X      | X   | L   | Output                   | Input                    | Real-time B data to A bus           |
| L               | L   | X      | H or L | X   | H   | Output                   | Input                    | Stored B data to A bus              |
| L               | H   | X      | X      | L   | X   | Input                    | Output                   | Real-time A data to B bus           |
| L               | H   | H or L | X      | H   | X   | Input                    | Output                   | Stored A data to B bus              |

<sup>†</sup> The data output functions can be enabled or disabled by various signals at  $\overline{OE}$  and DIR. Data input functions are always enabled; i.e., data at the bus terminals is stored on every low-to-high transition of the clock inputs.

SN54ALS648, SN74ALS648A, SN74AS648

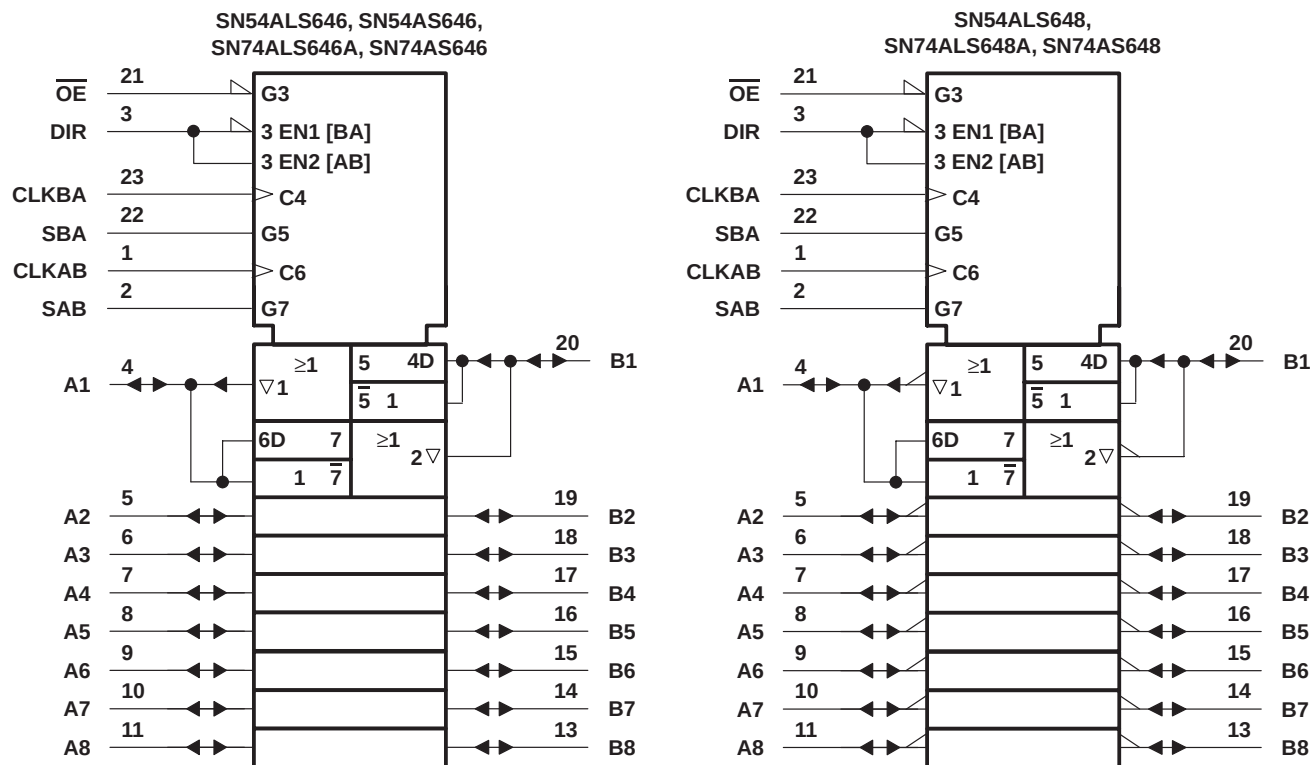
| INPUTS          |     |        |        |     |     | DATA I/O                 |                          | OPERATION OR FUNCTION                  |
|-----------------|-----|--------|--------|-----|-----|--------------------------|--------------------------|----------------------------------------|
| $\overline{OE}$ | DIR | CLKAB  | CLKBA  | SAB | SBA | A1–A8                    | B1–B8                    |                                        |
| X               | X   | ↑      | X      | X   | X   | Input                    | Unspecified <sup>†</sup> | Store A, B unspecified <sup>†</sup>    |
| X               | X   | X      | ↑      | X   | X   | Unspecified <sup>†</sup> | Input                    | Store B, A unspecified <sup>†</sup>    |
| H               | X   | ↑      | ↑      | X   | X   | Input                    | Input                    | Store A and B data                     |
| H               | X   | H or L | H or L | X   | X   | Input disabled           | Input disabled           | Isolation, hold storage                |
| L               | L   | X      | X      | X   | L   | Output                   | Input                    | Real-time $\overline{B}$ data to A bus |
| L               | L   | X      | H or L | X   | H   | Output                   | Input                    | Stored $\overline{B}$ data to A bus    |
| L               | H   | X      | X      | L   | X   | Input                    | Output                   | Real-time $\overline{A}$ data to B bus |
| L               | H   | H or L | X      | H   | X   | Input                    | Output                   | Stored $\overline{A}$ data to B bus    |

<sup>†</sup> The data output functions can be enabled or disabled by various signals at  $\overline{OE}$  and DIR. Data input functions are always enabled; i.e., data at the bus terminals is stored on every low-to-high transition of the clock inputs.

# SN54ALS646, SN54ALS648, SN54AS646 SN74ALS646A, SN74ALS648A, SN74AS646, SN74AS648 OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS

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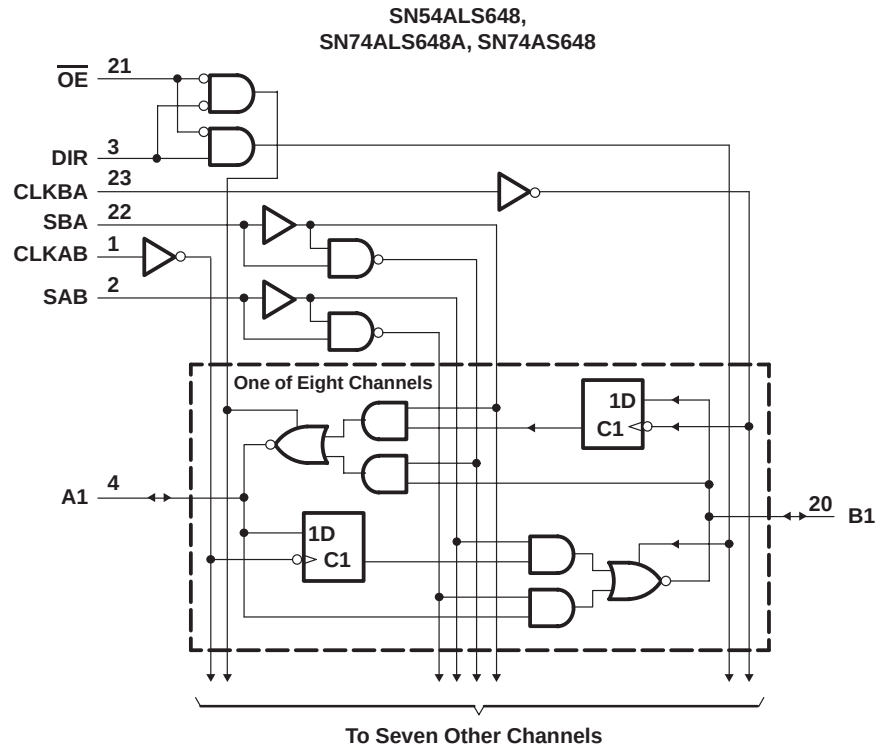
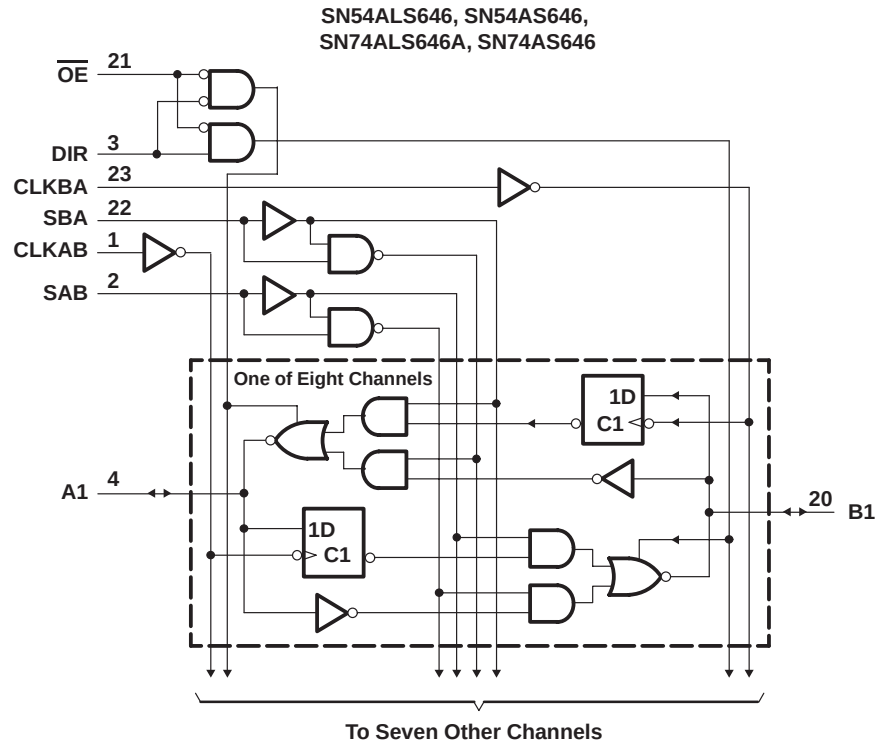
## logic symbols†



† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.  
Pin numbers shown are for the DW, JT, and NT packages.

SN54ALS646, SN54ALS648, SN54AS646  
 SN74ALS646A, SN74ALS648A, SN74AS646, SN74AS648  
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logic diagrams (positive logic)



Pin numbers shown are for the DW, JT, and NT packages.

**SN54ALS646, SN54ALS648, SN54AS646**  
**SN74ALS646A, SN74ALS648A, SN74AS646, SN74AS648**  
**OCTAL BUS TRANSCEIVERS AND REGISTERS WITH 3-STATE OUTPUTS**  
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**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

|                                                          |                |
|----------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$                                 | 7 V            |
| Input voltage, $V_I$ : Control inputs                    | 7 V            |
| I/O ports                                                | 5.5 V          |
| Operating free-air temperature range, $T_A$ : SN54ALS646 | –55°C to 125°C |
| SN74ALS646A                                              | 0°C to 70°C    |
| Storage temperature range                                | –65°C to 150°C |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” 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.

**recommended operating conditions**

|             |                                                                    | SN54ALS646 |     |     | SN74ALS646A |     |                 | UNIT |
|-------------|--------------------------------------------------------------------|------------|-----|-----|-------------|-----|-----------------|------|
|             |                                                                    | MIN        | NOM | MAX | MIN         | NOM | MAX             |      |
| $V_{CC}$    | Supply voltage                                                     | 4.5        | 5   | 5.5 | 4.5         | 5   | 5.5             | V    |
| $V_{IH}$    | High-level input voltage                                           | 2          |     |     | 2           |     |                 | V    |
| $V_{IL}$    | Low-level input voltage                                            |            |     | 0.7 |             |     | 0.8             | V    |
| $I_{OH}$    | High-level output current                                          |            |     | –12 |             |     | –15             | mA   |
| $I_{OL}$    | Low-level output current                                           |            |     | 12  |             |     | 24              | mA   |
|             |                                                                    |            |     |     |             |     | 48 <sup>‡</sup> |      |
| $f_{clock}$ | Clock frequency                                                    | 0          |     | 35  | 0           |     | 40              | MHz  |
| $t_w$       | Pulse duration, CLKBA or CLKAB high or low                         | 14.5       |     |     | 12.5        |     |                 | ns   |
| $t_{su}$    | Setup time, A before CLKAB $\uparrow$ or B before CLKBA $\uparrow$ | 15         |     |     | 10          |     |                 | ns   |
| $t_h$       | Hold time, A after CLKAB $\uparrow$ or B after CLKBA $\uparrow$    | 0          |     |     | 0           |     |                 | ns   |
| $T_A$       | Operating free-air temperature                                     | –55        |     | 125 | 0           |     | 70              | °C   |

<sup>‡</sup> Applies only to the -1 version and only if  $V_{CC}$  is maintained between 4.75 V and 5.25



**SN54ALS646, SN54ALS648, SN54AS646  
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**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

| PARAMETER         |                           | TEST CONDITIONS                                                     |                                    | SN54ALS646   |                  |      | SN74ALS646A  |                  |      | UNIT          |
|-------------------|---------------------------|---------------------------------------------------------------------|------------------------------------|--------------|------------------|------|--------------|------------------|------|---------------|
|                   |                           |                                                                     |                                    | MIN          | TYP <sup>†</sup> | MAX  | MIN          | TYP <sup>†</sup> | MAX  |               |
| $V_{IK}$          |                           | $V_{CC} = 4.5\text{ V}$ , $I_I = -18\text{ mA}$                     |                                    | -1.2         |                  |      | -1.2         |                  |      | V             |
| $V_{OH}$          |                           | $V_{CC} = 4.5\text{ V to }5.5\text{ V}$ , $I_{OH} = -0.4\text{ mA}$ |                                    | $V_{CC} - 2$ |                  |      | $V_{CC} - 2$ |                  |      | V             |
|                   |                           | $V_{CC} = 4.5\text{ V}$                                             | $I_{OH} = -3\text{ mA}$            | 2.4          | 3.2              |      | 2.4          | 3.2              |      |               |
|                   |                           |                                                                     | $I_{OH} = -12\text{ mA}$           | 2            |                  |      |              |                  |      |               |
|                   |                           |                                                                     | $I_{OH} = -15\text{ mA}$           |              |                  |      | 2            |                  |      |               |
| $V_{OL}$          |                           | $V_{CC} = 4.5\text{ V}$                                             | $I_{OL} = 12\text{ mA}$            | 0.25         | 0.4              |      | 0.25         | 0.4              |      | V             |
|                   |                           |                                                                     | $I_{OL} = 24\text{ mA}$            |              |                  |      | 0.35         | 0.5              |      |               |
|                   |                           |                                                                     | $I_{OL} = 48\text{ mA}^{\ddagger}$ |              |                  |      | 0.35         | 0.5              |      |               |
|                   |                           |                                                                     |                                    |              |                  |      |              |                  |      |               |
| $I_I$             | Control inputs            | $V_{CC} = 5.5\text{ V}$                                             | $V_I = 7\text{ V}$                 |              |                  | 0.1  |              |                  | 0.1  | mA            |
|                   | A or B ports              |                                                                     | $V_I = 5.5\text{ V}$               |              |                  | 0.1  |              |                  | 0.1  |               |
| $I_{IH}$          | Control inputs            | $V_{CC} = 5.5\text{ V}$ , $V_I = 2.7\text{ V}$                      |                                    |              |                  | 20   |              |                  | 20   | $\mu\text{A}$ |
|                   | A or B ports <sup>§</sup> |                                                                     |                                    |              |                  | 20   |              |                  | 20   |               |
| $I_{IL}$          | Control inputs            | $V_{CC} = 5.5\text{ V}$ , $V_I = 0.4\text{ V}$                      |                                    |              |                  | -0.2 |              |                  | -0.2 | mA            |
|                   | A or B ports <sup>§</sup> |                                                                     |                                    |              |                  | -0.2 |              |                  | -0.2 |               |
| $I_O^{\parallel}$ |                           | $V_{CC} = 5.5\text{ V}$ , $V_O = 2.25\text{ V}$                     |                                    | -20          |                  | -112 | -30          |                  | -112 | mA            |
| $I_{CC}$          |                           | $V_{CC} = 5.5\text{ V}$                                             | Outputs high                       | 47           | 76               |      | 47           | 76               |      | mA            |
|                   |                           |                                                                     | Outputs low                        | 55           | 88               |      | 55           | 88               |      |               |
|                   |                           |                                                                     | Outputs disabled                   | 55           | 88               |      | 55           | 88               |      |               |

<sup>†</sup> All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

<sup>‡</sup> Applies only to the -1 version and only if  $V_{CC}$  is maintained between 4.75 V and 5.25 V.

<sup>§</sup> For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

<sup>||</sup> The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

**SN54ALS646, SN54ALS648, SN54AS646**  
**SN74ALS646A, SN74ALS648A, SN74AS646, SN74AS648**  
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switching characteristics (see Figure 2)

| PARAMETER        | FROM<br>(INPUT)                               | TO<br>(OUTPUT) | V <sub>CC</sub> = 4.5 V to 5.5 V,<br>C <sub>L</sub> = 50 pF,<br>R1 = 500 Ω,<br>R2 = 500 Ω,<br>T <sub>A</sub> = MIN to MAX† |     |             |     | UNIT |
|------------------|-----------------------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------|-----|-------------|-----|------|
|                  |                                               |                | SN54ALS646                                                                                                                 |     | SN74ALS646A |     |      |
|                  |                                               |                | MIN                                                                                                                        | MAX | MIN         | MAX |      |
| f <sub>max</sub> |                                               |                | 35                                                                                                                         |     | 40          |     | MHz  |
| t <sub>PLH</sub> | CLKBA or CLKAB                                | A or B         | 10                                                                                                                         | 35  | 7           | 30  | ns   |
| t <sub>PHL</sub> |                                               |                | 5                                                                                                                          | 20  | 5           | 17  |      |
| t <sub>PLH</sub> | A or B                                        | B or A         | 5                                                                                                                          | 22  | 3           | 20  | ns   |
| t <sub>PHL</sub> |                                               |                | 3                                                                                                                          | 15  | 3           | 12  |      |
| t <sub>PLH</sub> | SBA or SAB <sup>‡</sup><br>(stored data low)  | A or B         | 10                                                                                                                         | 40  | 7           | 35  | ns   |
| t <sub>PHL</sub> |                                               |                | 5                                                                                                                          | 23  | 5           | 20  |      |
| t <sub>PLH</sub> | SBA or SAB <sup>‡</sup><br>(stored data high) | A or B         | 8                                                                                                                          | 30  | 6           | 25  | ns   |
| t <sub>PHL</sub> |                                               |                | 5                                                                                                                          | 24  | 5           | 20  |      |
| t <sub>PZH</sub> | $\overline{OE}$                               | A or B         | 3                                                                                                                          | 20  | 2           | 17  | ns   |
| t <sub>PZL</sub> |                                               |                | 5                                                                                                                          | 22  | 4           | 20  |      |
| t <sub>PHZ</sub> | $\overline{OE}$                               | A or B         | 1                                                                                                                          | 12  | 1           | 10  | ns   |
| t <sub>PLZ</sub> |                                               |                | 1                                                                                                                          | 20  | 2           | 16  |      |
| t <sub>PZH</sub> | DIR                                           | A or B         | 5                                                                                                                          | 38  | 3           | 30  | ns   |
| t <sub>PZL</sub> |                                               |                | 5                                                                                                                          | 30  | 4           | 25  |      |
| t <sub>PHZ</sub> | DIR                                           | A or B         | 1                                                                                                                          | 12  | 1           | 10  | ns   |
| t <sub>PLZ</sub> |                                               |                | 2                                                                                                                          | 21  | 2           | 16  |      |

† For conditions shown MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ These parameters are measured with the internal output state of the storage register opposite that of the bus input.



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**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

|                                                          |                |
|----------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$                                 | 7 V            |
| Input voltage, $V_I$ : Control inputs                    | 7 V            |
| I/O ports                                                | 5.5 V          |
| Operating free-air temperature range, $T_A$ : SN54ALS648 | –55°C to 125°C |
| SN74ALS648A                                              | 0°C to 70°C    |
| Storage temperature range                                | –65°C to 150°C |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” 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.

**recommended operating conditions**

|             |                                                                    | SN54ALS648 |     |     | SN74ALS648A |     |     | UNIT |
|-------------|--------------------------------------------------------------------|------------|-----|-----|-------------|-----|-----|------|
|             |                                                                    | MIN        | NOM | MAX | MIN         | NOM | MAX |      |
| $V_{CC}$    | Supply voltage                                                     | 4.5        | 5   | 5.5 | 4.5         | 5   | 5.5 | V    |
| $V_{IH}$    | High-level input voltage                                           | 2          |     |     | 2           |     |     | V    |
| $V_{IL}$    | Low-level input voltage                                            |            |     | 0.7 |             |     | 0.8 | V    |
| $I_{OH}$    | High-level output current                                          |            |     | –12 |             |     | –15 | mA   |
| $I_{OL}$    | Low-level output current                                           |            |     | 12  |             |     | 24  | mA   |
| $f_{clock}$ | Clock frequency                                                    | 0          |     | 35  | 0           |     | 40  | MHz  |
| $t_w$       | Pulse duration, CLKBA or CLKAB high or low                         | 14.5       |     |     | 12.5        |     |     | ns   |
| $t_{su}$    | Setup time, A before CLKAB $\uparrow$ or B before CLKBA $\uparrow$ | 15         |     |     | 10          |     |     | ns   |
| $t_h$       | Hold time, A after CLKAB $\uparrow$ or B after CLKBA $\uparrow$    | 0          |     |     | 0           |     |     | ns   |
| $T_A$       | Operating free-air temperature                                     | –55        |     | 125 | 0           |     | 70  | °C   |



**SN54ALS646, SN54ALS648, SN54AS646**  
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**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

| PARAMETER                   |                | TEST CONDITIONS                                             |                          | SN54ALS648          |      | SN74ALS648A         |     | UNIT |      |
|-----------------------------|----------------|-------------------------------------------------------------|--------------------------|---------------------|------|---------------------|-----|------|------|
|                             |                |                                                             |                          | MIN                 | TYP† | MAX                 | MIN |      | TYP† |
| V <sub>IK</sub>             |                | V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = −18 mA            |                          | −1.2                |      | −1.2                |     | V    |      |
| V <sub>OH</sub>             |                | V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = −0.4 mA |                          | V <sub>CC</sub> − 2 |      | V <sub>CC</sub> − 2 |     | V    |      |
|                             |                | V <sub>CC</sub> = 4.5 V                                     | I <sub>OH</sub> = −3 mA  | 2.4                 | 3.2  | 2.4                 | 3.2 |      |      |
|                             |                |                                                             | I <sub>OH</sub> = −12 mA | 2                   |      |                     |     |      |      |
|                             |                |                                                             | I <sub>OH</sub> = −15 mA |                     |      | 2                   |     |      |      |
| V <sub>OL</sub>             |                | V <sub>CC</sub> = 4.5 V                                     | I <sub>OL</sub> = 12 mA  | 0.25                | 0.4  | 0.25                | 0.4 | V    |      |
|                             |                |                                                             | I <sub>OL</sub> = 24 mA  |                     |      | 0.35                | 0.5 |      |      |
| I <sub>I</sub>              | Control inputs | V <sub>CC</sub> = 5.5 V                                     | V <sub>I</sub> = 7 V     | 0.1                 |      | 0.1                 |     | mA   |      |
|                             | A or B ports   |                                                             | V <sub>I</sub> = 5.5 V   | 0.1                 |      | 0.1                 |     |      |      |
| I <sub>IH</sub>             | Control inputs | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V             | 20                       |                     | 20   |                     | μA  |      |      |
|                             | A or B ports‡  |                                                             | 20                       |                     | 20   |                     |     |      |      |
| I <sub>IL</sub>             | Control inputs | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V             | −0.2                     |                     | −0.2 |                     | mA  |      |      |
|                             | A or B ports‡  |                                                             | −0.2                     |                     | −0.2 |                     |     |      |      |
| I <sub>O</sub> <sup>§</sup> |                | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V            | −20                      | −112                | −30  | −112                | mA  |      |      |
| I <sub>CC</sub>             |                | V <sub>CC</sub> = 5.5 V                                     | Outputs high             |                     | 47   | 76                  | 47  | 76   | mA   |
|                             |                |                                                             | Outputs low              |                     | 57   | 88                  | 57  | 88   |      |
|                             |                |                                                             | Outputs disabled         |                     | 57   | 88                  | 57  | 88   |      |

<sup>†</sup> All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

<sup>‡</sup> For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

<sup>§</sup> The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

SN54ALS646, SN54ALS648, SN54AS646  
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switching characteristics (see Figure 2)

| PARAMETER        | FROM<br>(INPUT)                   | TO<br>(OUTPUT) | V <sub>CC</sub> = 4.5 V to 5.5 V,<br>C <sub>L</sub> = 50 pF,<br>R <sub>1</sub> = 500 Ω,<br>R <sub>2</sub> = 500 Ω,<br>T <sub>A</sub> = MIN to MAX† |     |             |     | UNIT |
|------------------|-----------------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------------------|-----|-------------|-----|------|
|                  |                                   |                | SN54ALS648                                                                                                                                         |     | SN74ALS648A |     |      |
|                  |                                   |                | MIN                                                                                                                                                | MAX | MIN         | MAX |      |
| f <sub>max</sub> |                                   |                | 35                                                                                                                                                 |     | 40          |     | MHz  |
| t <sub>PLH</sub> | CLKBA or CLKAB                    | A or B         | 8                                                                                                                                                  | 39  | 7           | 33  | ns   |
| t <sub>PHL</sub> |                                   |                | 5                                                                                                                                                  | 23  | 5           | 20  |      |
| t <sub>PLH</sub> | A or B                            | B or A         | 3                                                                                                                                                  | 20  | 2           | 17  | ns   |
| t <sub>PHL</sub> |                                   |                | 2                                                                                                                                                  | 12  | 2           | 10  |      |
| t <sub>PLH</sub> | SBA or SAB‡<br>(stored data low)  | A or B         | 5                                                                                                                                                  | 44  | 5           | 39  | ns   |
| t <sub>PHL</sub> |                                   |                | 4                                                                                                                                                  | 26  | 4           | 22  |      |
| t <sub>PLH</sub> | SBA or SAB‡<br>(stored data high) | A or B         | 6                                                                                                                                                  | 30  | 6           | 25  | ns   |
| t <sub>PHL</sub> |                                   |                | 6                                                                                                                                                  | 25  | 6           | 21  |      |
| t <sub>PZH</sub> | $\overline{OE}$                   | A or B         | 4                                                                                                                                                  | 25  | 2           | 22  | ns   |
| t <sub>PZL</sub> |                                   |                | 4                                                                                                                                                  | 25  | 4           | 22  |      |
| t <sub>PHZ</sub> | $\overline{OE}$                   | A or B         | 1                                                                                                                                                  | 12  | 1           | 10  | ns   |
| t <sub>PLZ</sub> |                                   |                | 2                                                                                                                                                  | 21  | 2           | 15  |      |
| t <sub>PZH</sub> | DIR                               | A or B         | 4                                                                                                                                                  | 35  | 2           | 27  | ns   |
| t <sub>PZL</sub> |                                   |                | 3                                                                                                                                                  | 25  | 3           | 19  |      |
| t <sub>PHZ</sub> | DIR                               | A or B         | 1                                                                                                                                                  | 17  | 1           | 14  | ns   |
| t <sub>PLZ</sub> |                                   |                | 2                                                                                                                                                  | 22  | 2           | 15  |      |

† For conditions shown MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ These parameters are measured with the internal output state of the storage register opposite that of the bus input.

**SN54ALS646, SN54ALS648, SN54AS646**  
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**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

Supply voltage,  $V_{CC}$  ..... 7 V  
Input voltage,  $V_I$ : Control inputs ..... 7 V  
I/O ports ..... 5.5 V  
Operating free-air temperature range,  $T_A$ : SN54AS646 ..... –55°C to 125°C  
SN74AS646 ..... 0°C to 70°C  
Storage temperature range ..... –65°C to 150°C

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” 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.

**recommended operating conditions**

|                      |                                                |                     | SN54AS646 |     |     | SN74AS646 |     |     | UNIT |
|----------------------|------------------------------------------------|---------------------|-----------|-----|-----|-----------|-----|-----|------|
|                      |                                                |                     | MIN       | NOM | MAX | MIN       | NOM | MAX |      |
| V <sub>CC</sub>      | Supply voltage                                 |                     | 4.5       | 5   | 5.5 | 4.5       | 5   | 5.5 | V    |
| V <sub>IH</sub>      | High-level input voltage                       |                     | 2         |     |     | 2         |     |     | V    |
| V <sub>IL</sub>      | Low-level input voltage                        |                     | 0.8       |     |     | 0.8       |     |     | V    |
| I <sub>OH</sub>      | High-level output current                      |                     | −12       |     |     | −15       |     |     | mA   |
| I <sub>OL</sub>      | Low-level output current                       |                     | 32        |     |     | 48        |     |     | mA   |
| f <sub>clock</sub> * | Clock frequency                                |                     | 0         | 75  |     | 0         | 90  |     | MHz  |
| t <sub>w</sub> *     | Pulse duration                                 | CLKBA or CLKAB high | 6         |     |     | 5         |     |     | ns   |
|                      |                                                | CLKBA or CLKAB low  | 7         |     |     | 6         |     |     |      |
| t <sub>su</sub> *    | Setup time, A before CLKAB↑ or B before CLKBA↑ |                     | 7         |     |     | 6         |     |     | ns   |
| t <sub>h</sub> *     | Hold time, A after CLKAB↑ or B before CLKBA    |                     | 0         |     |     | 0         |     |     | ns   |
| T <sub>A</sub>       | Operating free-air temperature                 |                     | −55       |     |     | 125       |     |     | °C   |

\* On products compliant to MIL-STD-883, Class B, this parameter is based on characterization data but is not production tested.



**SN54ALS646, SN54ALS648, SN54AS646**  
**SN74ALS646A, SN74ALS648A, SN74AS646, SN74AS648**  
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**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

| PARAMETER                   |                | TEST CONDITIONS                                           |                          | SN54AS646          |      |     | SN74AS646          |      |     | UNIT |
|-----------------------------|----------------|-----------------------------------------------------------|--------------------------|--------------------|------|-----|--------------------|------|-----|------|
|                             |                |                                                           |                          | MIN                | TYP† | MAX | MIN                | TYP† | MAX |      |
| V <sub>IK</sub>             |                | V <sub>CC</sub> = 4.5 V, I <sub>I</sub> = −18 mA          |                          | −1.2               |      |     | −1.2               |      |     | V    |
| V <sub>OH</sub>             |                | V <sub>CC</sub> = 4.5 V to 5.5 V, I <sub>OH</sub> = −2 mA |                          | V <sub>CC</sub> −2 |      |     | V <sub>CC</sub> −2 |      |     | V    |
|                             |                | V <sub>CC</sub> = 4.5 V                                   | I <sub>OH</sub> = −3 mA  | 2.4                | 3.2  | 2.4 | 3.2                |      |     |      |
|                             |                |                                                           | I <sub>OH</sub> = −12 mA | 2                  |      |     |                    |      |     |      |
|                             |                |                                                           | I <sub>OH</sub> = −15 mA |                    |      | 2   |                    |      |     |      |
| V <sub>OL</sub>             |                | V <sub>CC</sub> = 4.5 V                                   | I <sub>OL</sub> = 32 mA  | 0.25               | 0.5  |     |                    |      | V   |      |
|                             |                |                                                           | I <sub>OL</sub> = 48 mA  |                    |      |     | 0.35               | 0.5  |     |      |
| I <sub>I</sub>              | Control inputs | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 7 V             |                          | 0.1                |      |     | 0.1                |      |     | mA   |
|                             | A or B ports   | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 5.5 V           |                          | 0.1                |      |     | 0.1                |      |     |      |
| I <sub>IH</sub>             | Control inputs | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 2.7 V           |                          | 20                 |      |     | 20                 |      |     | μA   |
|                             | A or B ports‡  |                                                           |                          | 70                 |      |     | 70                 |      |     |      |
| I <sub>IL</sub>             | Control input  | V <sub>CC</sub> = 5.5 V, V <sub>I</sub> = 0.4 V           |                          | −0.5               |      |     | −0.5               |      |     | mA   |
|                             | A or B ports‡  |                                                           |                          | −0.75              |      |     | −0.75              |      |     |      |
| I <sub>O</sub> <sup>§</sup> |                | V <sub>CC</sub> = 5.5 V, V <sub>O</sub> = 2.25 V          |                          | −30                | −112 | −30 | −112               | mA   |     |      |
| I <sub>CC</sub>             |                | V <sub>CC</sub> = 5.5 V                                   | Outputs high             | 120                | 195  | 120 | 195                | mA   |     |      |
|                             |                |                                                           | Outputs low              | 130                | 211  | 130 | 211                |      |     |      |
|                             |                |                                                           | Outputs disabled         | 130                | 211  | 130 | 211                |      |     |      |

† All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

‡ For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

§ The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .

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**switching characteristics (see Figure 2)**

| PARAMETER          | FROM<br>(INPUT)         | TO<br>(OUTPUT) | V <sub>CC</sub> = 4.5 V to 5.5 V,<br>C <sub>L</sub> = 50 pF,<br>R1 = 500 Ω,<br>R2 = 500 Ω,<br>T <sub>A</sub> = MIN to MAX <sup>†</sup> |      |           |     | UNIT |
|--------------------|-------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------------------|------|-----------|-----|------|
|                    |                         |                | SN54AS646                                                                                                                              |      | SN74AS646 |     |      |
|                    |                         |                | MIN                                                                                                                                    | MAX  | MIN       | MAX |      |
| f <sub>max</sub> * |                         |                | 75                                                                                                                                     |      | 90        |     | MHz  |
| t <sub>PLH</sub>   | CLKBA or CLKAB          | A or B         | 2                                                                                                                                      | 9.5  | 2         | 8.5 | ns   |
| t <sub>PHL</sub>   |                         |                | 2                                                                                                                                      | 10   | 2         | 9   |      |
| t <sub>PLH</sub>   | A or B                  | B or A         | 2                                                                                                                                      | 11.5 | 2         | 9   | ns   |
| t <sub>PHL</sub>   |                         |                | 1                                                                                                                                      | 8    | 1         | 7   |      |
| t <sub>PLH</sub>   | SBA or SAB <sup>‡</sup> | A or B         | 2                                                                                                                                      | 13.5 | 2         | 11  | ns   |
| t <sub>PHL</sub>   |                         |                | 2                                                                                                                                      | 11   | 2         | 9   |      |
| t <sub>PZH</sub>   | $\overline{\text{OE}}$  | A or B         | 2                                                                                                                                      | 11   | 2         | 9   | ns   |
| t <sub>PZL</sub>   |                         |                | 3                                                                                                                                      | 15   | 3         | 14  |      |
| t <sub>PHZ</sub>   | $\overline{\text{OE}}$  | A or B         | 2                                                                                                                                      | 11   | 2         | 9   | ns   |
| t <sub>PLZ</sub>   |                         |                | 2                                                                                                                                      | 11   | 2         | 9   |      |
| t <sub>PZH</sub>   | DIR                     | A or B         | 3                                                                                                                                      | 21   | 3         | 16  | ns   |
| t <sub>PZL</sub>   |                         |                | 3                                                                                                                                      | 24   | 3         | 18  |      |
| t <sub>PHZ</sub>   | DIR                     | A or B         | 2                                                                                                                                      | 12   | 2         | 10  | ns   |
| t <sub>PLZ</sub>   |                         |                | 2                                                                                                                                      | 12   | 2         | 10  |      |

\* On products compliant to MIL-STD-883, Class B, this parameter is based on characterization data but is not production tested.

† For conditions shown MIN or MAX, use the appropriate value specified under recommended operating conditions.

‡ These parameters are measured with the internal output state of the storage register opposite that of the bus input.

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SN74ALS646A, SN74ALS648A, SN74AS646, SN74AS648  
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**absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>**

|                                                         |                |
|---------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$                                | 7 V            |
| Input voltage, $V_I$ : Control inputs                   | 7 V            |
| I/O ports                                               | 5.5 V          |
| Operating free-air temperature range, $T_A$ : SN74AS648 | 0°C to 70°C    |
| Storage temperature range                               | –65°C to 150°C |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” 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.

**recommended operating conditions**

|             |                                                                    | SN74AS648           |     |     | UNIT |
|-------------|--------------------------------------------------------------------|---------------------|-----|-----|------|
|             |                                                                    | MIN                 | NOM | MAX |      |
| $V_{CC}$    | Supply voltage                                                     | 4.5                 | 5   | 5.5 | V    |
| $V_{IH}$    | High-level input voltage                                           | 2                   |     |     | V    |
| $V_{IL}$    | Low-level input voltage                                            |                     |     | 0.8 | V    |
| $I_{OH}$    | High-level output current                                          |                     |     | –15 | mA   |
| $I_{OL}$    | Low-level output current                                           |                     |     | 48  | mA   |
| $f_{clock}$ | Clock frequency                                                    | 0                   |     | 90  | MHz  |
| $t_w$       | Pulse duration                                                     | CLKBA or CLKAB high |     | 5   | ns   |
|             |                                                                    | CLKBA or CLKAB low  |     | 6   |      |
| $t_{su}$    | Setup time, A before CLKAB $\uparrow$ or B before CLKBA $\uparrow$ | 6                   |     |     | ns   |
| $t_h$       | Hold time, A after CLKAB $\uparrow$ or B before CLKBA              | 0                   |     |     | ns   |
| $T_A$       | Operating free-air temperature                                     | 0                   |     | 70  | °C   |

**electrical characteristics over recommended operating free-air temperature range (unless otherwise noted)**

| PARAMETER         |                           | TEST CONDITIONS                                                       |                      | SN74AS648    |                  | UNIT  |
|-------------------|---------------------------|-----------------------------------------------------------------------|----------------------|--------------|------------------|-------|
|                   |                           |                                                                       |                      | MIN          | TYP <sup>‡</sup> | MAX   |
| $V_{IK}$          |                           | $V_{CC} = 4.5\text{ V}$ ,<br>$I_I = -18\text{ mA}$                    |                      |              |                  | –1.2  |
| $V_{OH}$          |                           | $V_{CC} = 4.5\text{ V to } 5.5\text{ V}$ ,<br>$I_{OH} = -2\text{ mA}$ |                      | $V_{CC} - 2$ |                  | V     |
|                   |                           | $V_{CC} = 4.5\text{ V}$ ,<br>$I_{OH} = -3\text{ mA}$                  |                      | 2.4          | 3.2              |       |
|                   |                           | $V_{CC} = 4.5\text{ V}$ ,<br>$I_{OH} = -15\text{ mA}$                 |                      | 2            |                  |       |
| $V_{OL}$          |                           | $V_{CC} = 4.5\text{ V}$ ,<br>$I_{OL} = 48\text{ mA}$                  |                      | 0.35         | 0.5              | V     |
| $I_I$             | Control inputs            | $V_{CC} = 5.5\text{ V}$                                               | $V_I = 7\text{ V}$   |              |                  | 0.1   |
|                   | A or B ports              |                                                                       | $V_I = 5.5\text{ V}$ |              |                  | 0.1   |
| $I_{IH}$          | Control inputs            | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 2.7\text{ V}$                     |                      |              |                  | 20    |
|                   | A or B ports <sup>§</sup> |                                                                       |                      |              |                  | 70    |
| $I_{IL}$          | Control input             | $V_{CC} = 5.5\text{ V}$ ,<br>$V_I = 0.4\text{ V}$                     |                      |              |                  | –0.5  |
|                   | A or B ports <sup>§</sup> |                                                                       |                      |              |                  | –0.75 |
| $I_O^{\parallel}$ |                           | $V_{CC} = 5.5\text{ V}$ ,<br>$V_O = 2.25\text{ V}$                    |                      | –30          |                  | –112  |
| $I_{CC}$          |                           | $V_{CC} = 5.5\text{ V}$                                               | Outputs high         |              | 110              | 185   |
|                   |                           |                                                                       | Outputs low          |              | 120              | 195   |
|                   |                           |                                                                       | Outputs disabled     |              | 120              | 195   |

<sup>‡</sup> All typical values are at  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$ .

<sup>§</sup> For I/O ports, the parameters  $I_{IH}$  and  $I_{IL}$  include the off-state output current.

<sup>||</sup> The output conditions have been chosen to produce a current that closely approximates one half of the true short-circuit output current,  $I_{OS}$ .



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**switching characteristics (see Figure 2)**

| PARAMETER        | FROM<br>(INPUT)        | TO<br>(OUTPUT) | V <sub>CC</sub> = 4.5 V to 5.5 V,<br>C <sub>L</sub> = 50 pF,<br>R1 = 500 Ω,<br>R2 = 500 Ω,<br>T <sub>A</sub> = MIN to MAX† |     | UNIT |
|------------------|------------------------|----------------|----------------------------------------------------------------------------------------------------------------------------|-----|------|
|                  |                        |                | SN74AS648                                                                                                                  |     |      |
|                  |                        |                | MIN                                                                                                                        | MAX |      |
| f <sub>max</sub> |                        |                | 90                                                                                                                         |     | MHz  |
| t <sub>PLH</sub> | CLKBA or CLKAB         | A or B         | 2                                                                                                                          | 8.5 | ns   |
| t <sub>PHL</sub> |                        |                | 2                                                                                                                          | 9   |      |
| t <sub>PLH</sub> | A or B                 | B or A         | 2                                                                                                                          | 8   | ns   |
| t <sub>PHL</sub> |                        |                | 1                                                                                                                          | 7   |      |
| t <sub>PLH</sub> | SBA or SAB‡            | A or B         | 2                                                                                                                          | 11  | ns   |
| t <sub>PHL</sub> |                        |                | 2                                                                                                                          | 9   |      |
| t <sub>PZH</sub> | $\overline{\text{OE}}$ | A or B         | 2                                                                                                                          | 9   | ns   |
| t <sub>PZL</sub> |                        |                | 3                                                                                                                          | 15  |      |
| t <sub>PHZ</sub> | $\overline{\text{OE}}$ | A or B         | 2                                                                                                                          | 9   | ns   |
| t <sub>PLZ</sub> |                        |                | 2                                                                                                                          | 9   |      |
| t <sub>PZH</sub> | DIR                    | A or B         | 3                                                                                                                          | 16  | ns   |
| t <sub>PZL</sub> |                        |                | 3                                                                                                                          | 18  |      |
| t <sub>PHZ</sub> | DIR                    | A or B         | 2                                                                                                                          | 10  | ns   |
| t <sub>PLZ</sub> |                        |                | 2                                                                                                                          | 10  |      |

† For conditions shown MIN or MAX, use the appropriate value specified under recommended operating conditions.

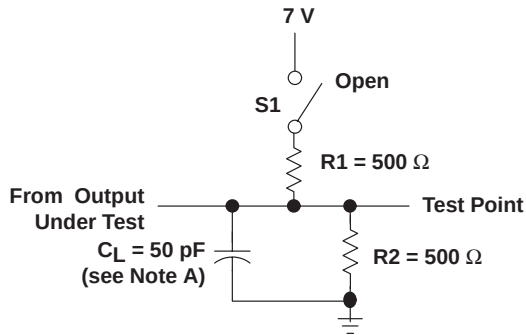
‡ These parameters are measured with the internal output state of the storage register opposite that of the bus input.



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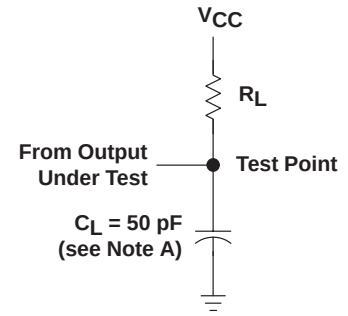
**PARAMETER MEASUREMENT INFORMATION**



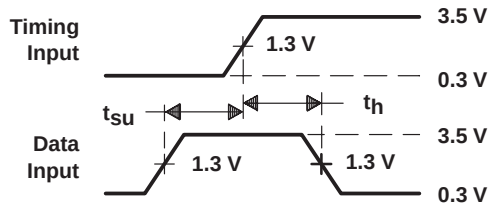
**LOAD CIRCUIT  
FOR 3-STATE OUTPUTS**

**SWITCH POSITION TABLE**

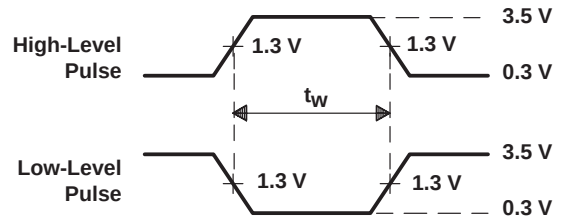
| TEST      | S1     |
|-----------|--------|
| $t_{PLH}$ | Open   |
| $t_{PHL}$ | Open   |
| $t_{PZH}$ | Open   |
| $t_{PZL}$ | Closed |
| $t_{PHZ}$ | Open   |
| $t_{PLZ}$ | Closed |



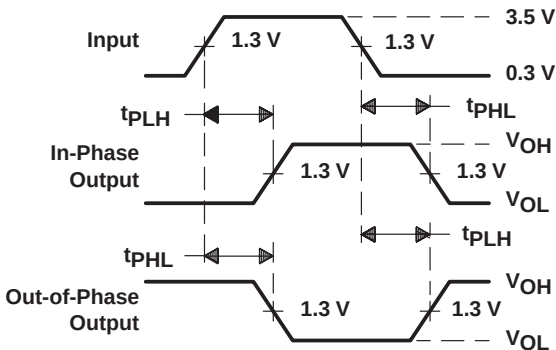
**LOAD CIRCUIT  
FOR OPEN-COLLECTOR OUTPUTS**



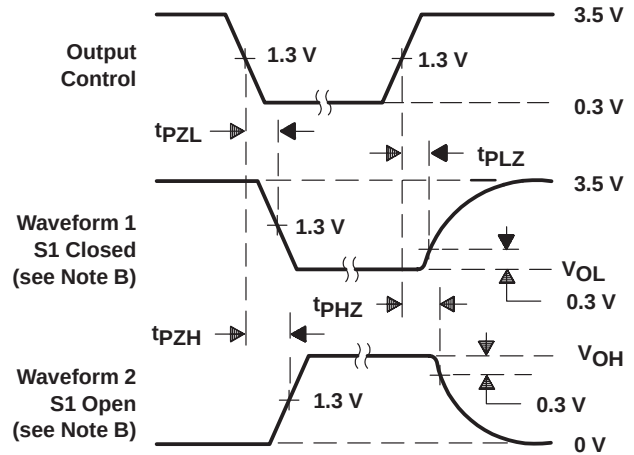
**VOLTAGE WAVEFORMS  
SETUP AND HOLD TIMES**



**VOLTAGE WAVEFORMS  
PULSE DURATION**



**VOLTAGE WAVEFORMS  
PROPAGATION DELAY TIMES**



**VOLTAGE WAVEFORMS  
ENABLE AND DISABLE TIMES, 3-STATE OUTPUTS**

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. Waveform 1 is for an output with internal conditions such that the output is low except when disabled by the output control. Waveform 2 is for an output with internal conditions such that the output is high except when disabled by the output control.  
C. All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 2 \text{ ns}$ ,  $t_f \leq 2 \text{ ns}$ .  
D. The outputs are measured one at a time with one transition per measurement.

**Figure 2. Load Circuits and Voltage Waveforms**

## PACKAGING INFORMATION

| Orderable part number          | Status<br>(1) | Material type<br>(2) | Package   Pins | Package qty   Carrier | RoHS<br>(3) | Lead finish/<br>Ball material<br>(4) | MSL rating/<br>Peak reflow<br>(5) | Op temp (°C) | Part marking<br>(6)             |
|--------------------------------|---------------|----------------------|----------------|-----------------------|-------------|--------------------------------------|-----------------------------------|--------------|---------------------------------|
| <a href="#">5962-8759501LA</a> | Active        | Production           | CDIP (JT)   24 | 15   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-8759501LA<br>SNJ54AS646JT  |
| <a href="#">5962-8995601LA</a> | Active        | Production           | CDIP (JT)   24 | 15   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-8995601LA<br>SNJ54ALS646JT |
| <a href="#">5962-9052301LA</a> | Active        | Production           | CDIP (JT)   24 | 15   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9052301LA<br>SNJ54ALS648JT |
| <a href="#">SN74ALS646ADW</a>  | Active        | Production           | SOIC (DW)   24 | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | ALS646A                         |
| SN74ALS646ADW.A                | Active        | Production           | SOIC (DW)   24 | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | ALS646A                         |
| <a href="#">SN74ALS646ADWR</a> | Active        | Production           | SOIC (DW)   24 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | ALS646A                         |
| SN74ALS646ADWR.A               | Active        | Production           | SOIC (DW)   24 | 2000   LARGE T&R      | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | ALS646A                         |
| <a href="#">SN74ALS648ADW</a>  | Active        | Production           | SOIC (DW)   24 | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | ALS648A                         |
| SN74ALS648ADW.A                | Active        | Production           | SOIC (DW)   24 | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | ALS648A                         |
| <a href="#">SN74AS646DW</a>    | Active        | Production           | SOIC (DW)   24 | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | AS646                           |
| SN74AS646DW.A                  | Active        | Production           | SOIC (DW)   24 | 25   TUBE             | Yes         | NIPDAU                               | Level-1-260C-UNLIM                | 0 to 70      | AS646                           |
| <a href="#">SNJ54ALS646JT</a>  | Active        | Production           | CDIP (JT)   24 | 15   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-8995601LA<br>SNJ54ALS646JT |
| SNJ54ALS646JT.A                | Active        | Production           | CDIP (JT)   24 | 15   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-8995601LA<br>SNJ54ALS646JT |
| <a href="#">SNJ54ALS648JT</a>  | Active        | Production           | CDIP (JT)   24 | 15   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9052301LA<br>SNJ54ALS648JT |
| SNJ54ALS648JT.A                | Active        | Production           | CDIP (JT)   24 | 15   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-9052301LA<br>SNJ54ALS648JT |
| <a href="#">SNJ54AS646JT</a>   | Active        | Production           | CDIP (JT)   24 | 15   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-8759501LA<br>SNJ54AS646JT  |
| SNJ54AS646JT.A                 | Active        | Production           | CDIP (JT)   24 | 15   TUBE             | No          | SNPB                                 | N/A for Pkg Type                  | -55 to 125   | 5962-8759501LA<br>SNJ54AS646JT  |

<sup>(1)</sup> **Status:** For more details on status, see our [product life cycle](#).

<sup>(2)</sup> **Material type:** When designated, preproduction parts are prototypes/experimental devices, and are not yet approved or released for full production. Testing and final process, including without limitation quality assurance, reliability performance testing, and/or process qualification, may not yet be complete, and this item is subject to further changes or possible discontinuation. If available for ordering, purchases will be subject to an additional waiver at checkout, and are intended for early internal evaluation purposes only. These items are sold without warranties of any kind.

<sup>(3)</sup> **RoHS values:** Yes, No, RoHS Exempt. See the [TI RoHS Statement](#) for additional information and value definition.

<sup>(4)</sup> **Lead finish/Ball material:** Parts may have multiple material finish options. Finish options are separated by a vertical ruled line. Lead finish/Ball material values may wrap to two lines if the finish value exceeds the maximum column width.

<sup>(5)</sup> **MSL rating/Peak reflow:** The moisture sensitivity level ratings and peak solder (reflow) temperatures. In the event that a part has multiple moisture sensitivity ratings, only the lowest level per JEDEC standards is shown. Refer to the shipping label for the actual reflow temperature that will be used to mount the part to the printed circuit board.

<sup>(6)</sup> **Part marking:** There may be an additional marking, which relates to the logo, the lot trace code information, or the environmental category of the part.

Multiple part markings will be inside parentheses. Only one part marking contained in parentheses and separated by a "~" will appear on a part. If a line is indented then it is a continuation of the previous line and the two combined represent the entire part marking for that device.

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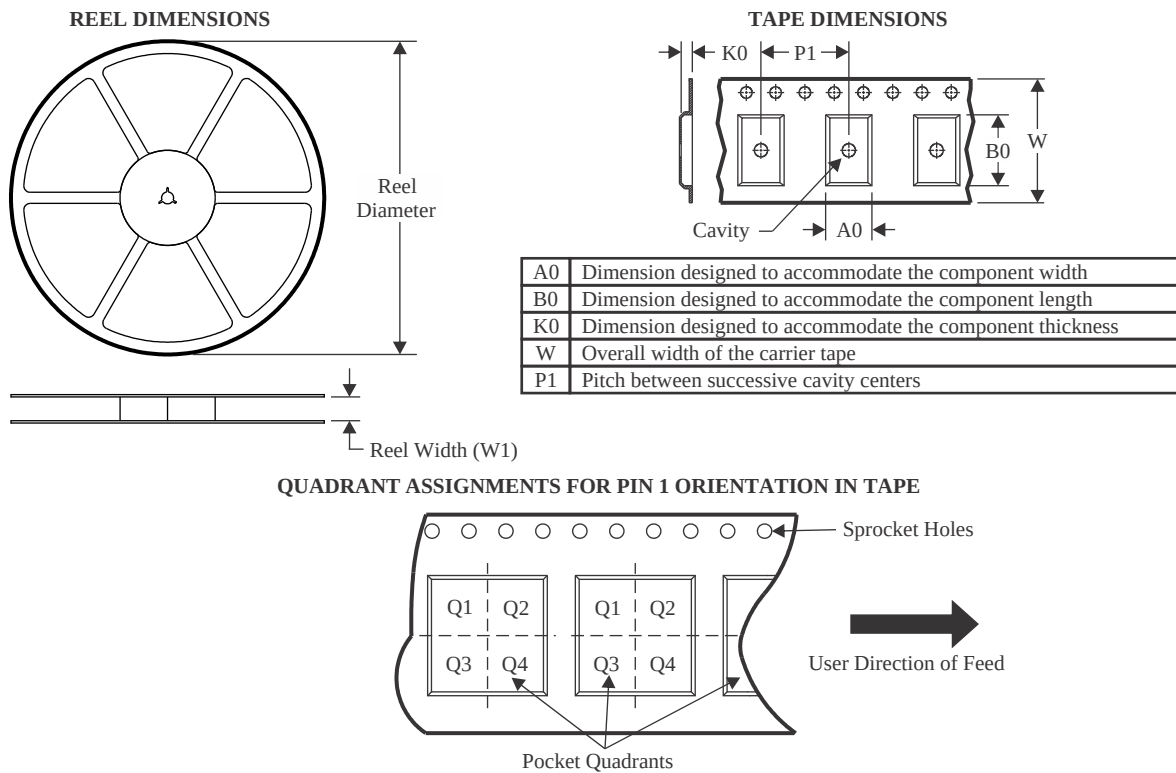
**OTHER QUALIFIED VERSIONS OF SN54AS646, SN74AS646 :**

- Catalog : [SN74AS646](#)
- Military : [SN54AS646](#)

**NOTE: Qualified Version Definitions:**

- Catalog - TI's standard catalog product
- Military - QML certified for Military and Defense Applications

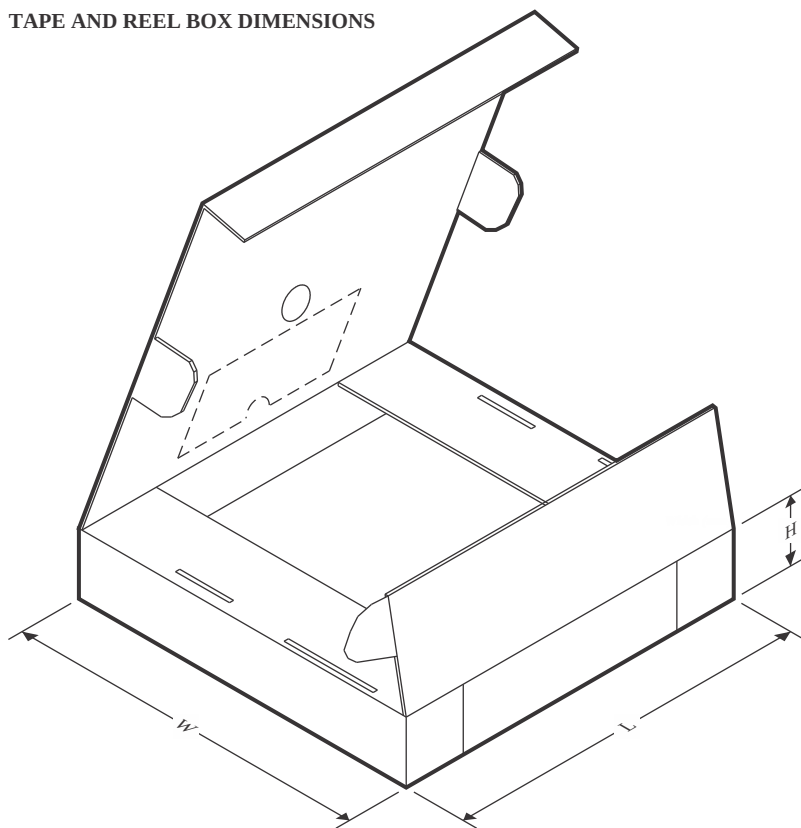
## TAPE AND REEL INFORMATION



\*All dimensions are nominal

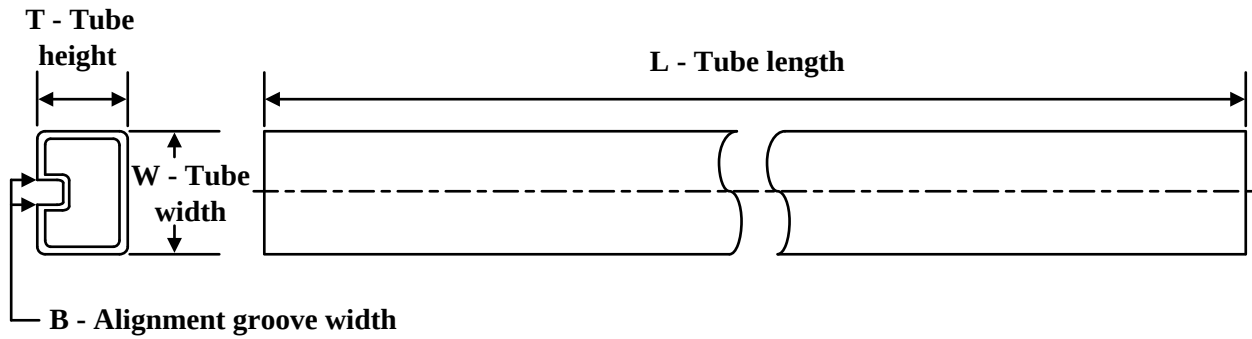
| Device         | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74ALS646ADWR | SOIC         | DW              | 24   | 2000 | 330.0              | 24.4               | 10.75   | 15.7    | 2.7     | 12.0    | 24.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74ALS646ADWR | SOIC         | DW              | 24   | 2000 | 350.0       | 350.0      | 43.0        |

**TUBE**


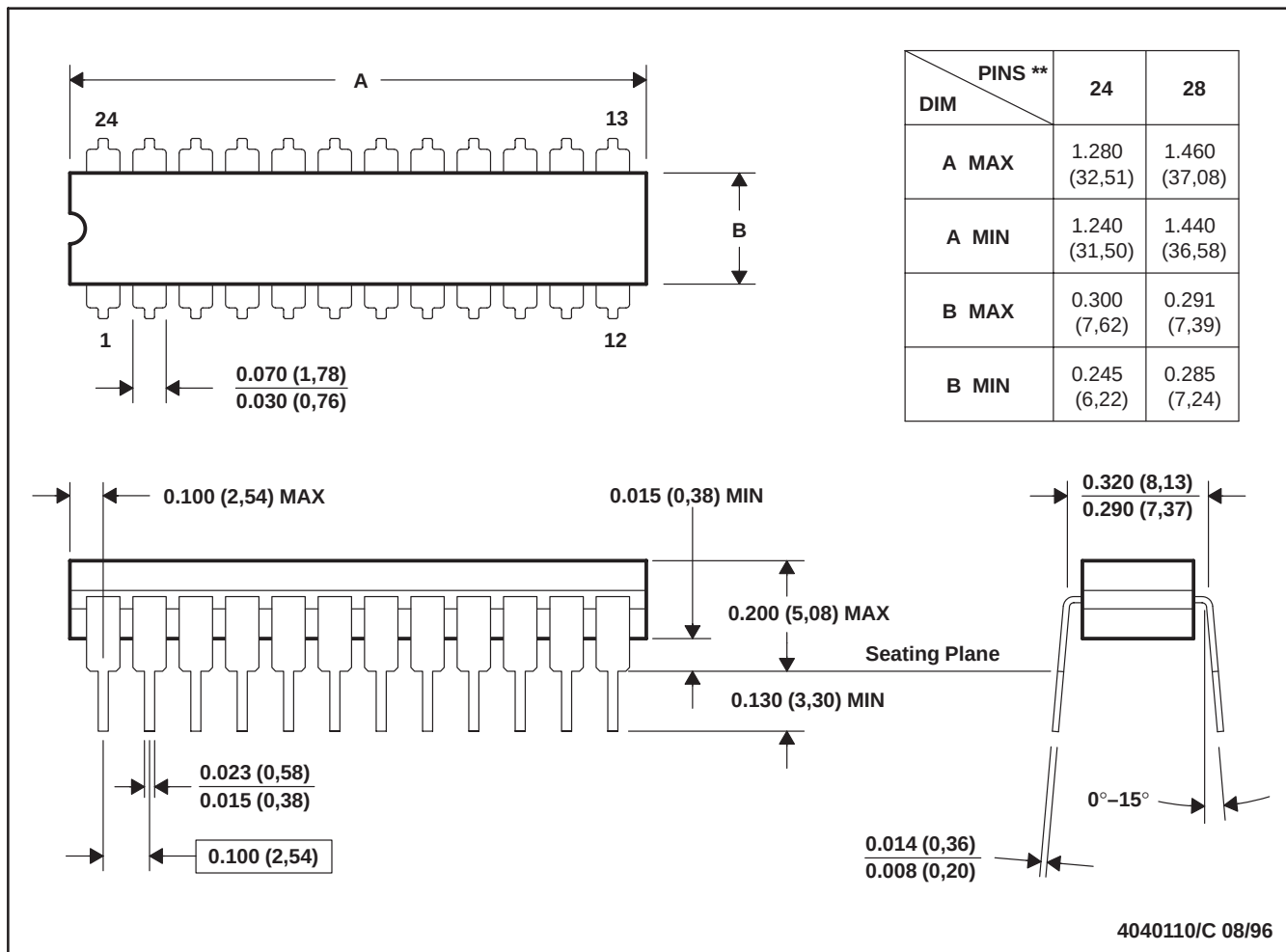
\*All dimensions are nominal

| Device          | Package Name | Package Type | Pins | SPQ | L (mm) | W (mm) | T (μm) | B (mm) |
|-----------------|--------------|--------------|------|-----|--------|--------|--------|--------|
| SN74ALS646ADW   | DW           | SOIC         | 24   | 25  | 506.98 | 12.7   | 4826   | 6.6    |
| SN74ALS646ADW.A | DW           | SOIC         | 24   | 25  | 506.98 | 12.7   | 4826   | 6.6    |
| SN74ALS648ADW   | DW           | SOIC         | 24   | 25  | 506.98 | 12.7   | 4826   | 6.6    |
| SN74ALS648ADW.A | DW           | SOIC         | 24   | 25  | 506.98 | 12.7   | 4826   | 6.6    |
| SN74AS646DW     | DW           | SOIC         | 24   | 25  | 506.98 | 12.7   | 4826   | 6.6    |
| SN74AS646DW.A   | DW           | SOIC         | 24   | 25  | 506.98 | 12.7   | 4826   | 6.6    |

## JT (R-GDIP-T\*\*)

## CERAMIC DUAL-IN-LINE

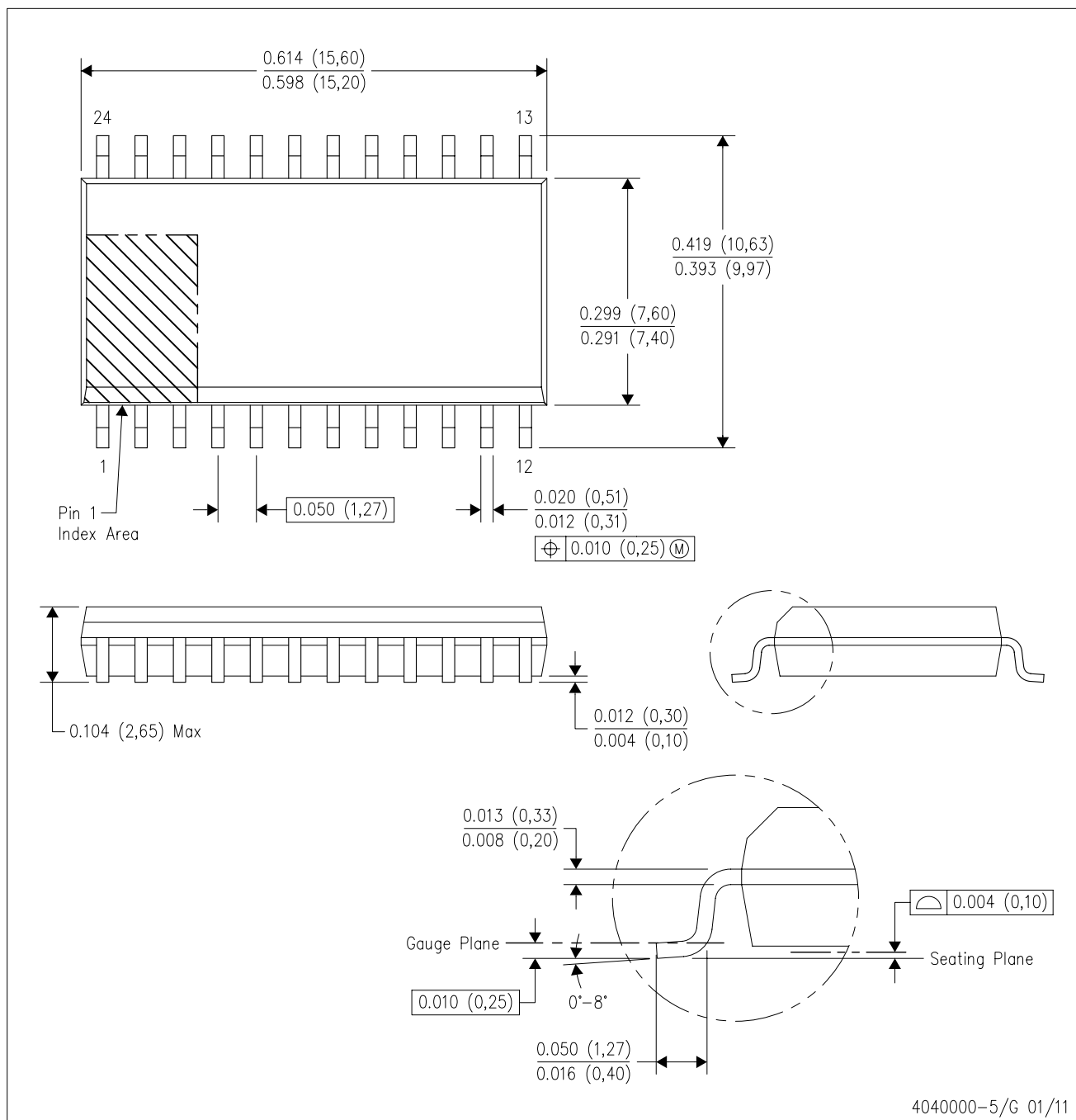
24 LEADS SHOWN



- NOTES: A. All linear dimensions are in inches (millimeters).  
 B. This drawing is subject to change without notice.  
 C. This package can be hermetically sealed with a ceramic lid using glass frit.  
 D. Index point is provided on cap for terminal identification.  
 E. Falls within MIL STD 1835 GDIP3-T24, GDIP4-T28, and JEDEC MO-058 AA, MO-058 AB

DW (R-PDSO-G24)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters). Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion not to exceed 0.006 (0,15).
  - D. Falls within JEDEC MS-013 variation AD.



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