

# SN54ALS08, SN54AS08, SN74ALS08, SN74AS08 QUADRUPLE 2-INPUT POSITIVE-AND GATES

SDAS191A – APRIL 1982 – REVISED DECEMBER 1994

- Package Options Include Plastic Small-Outline (D) Packages, Ceramic Chip Carriers (FK), and Standard Plastic (N) and Ceramic (J) 300-mil DIPs

## description

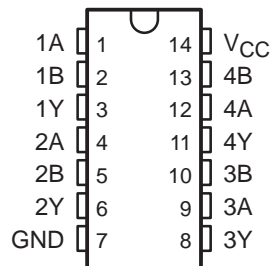
These devices contain four independent 2-input positive-AND gates. They perform the Boolean functions  $Y = A \bullet B$  or  $Y = \bar{A} + \bar{B}$  in positive logic.

The SN54ALS08 and SN54AS08 are characterized for operation over the full military temperature range of  $-55^{\circ}\text{C}$  to  $125^{\circ}\text{C}$ . The SN74ALS08 and SN74AS08 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

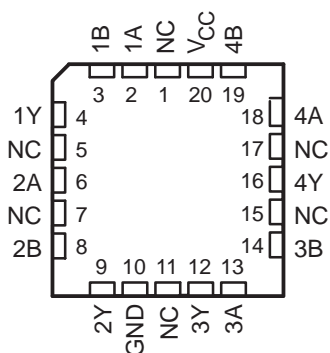
FUNCTION TABLE  
(each gate)

| INPUTS |   | OUTPUT<br>Y |
|--------|---|-------------|
| A      | B |             |
| H      | H | H           |
| L      | X | L           |
| X      | L | L           |

SN54ALS08, SN54AS08 . . . J PACKAGE  
SN74ALS08, SN74AS08 . . . D OR N PACKAGE  
(TOP VIEW)

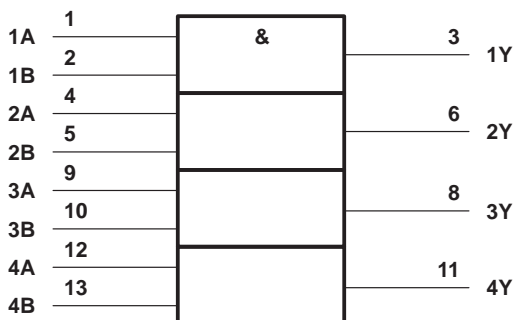


SN54ALS08, SN54AS08 . . . FK PACKAGE  
(TOP VIEW)

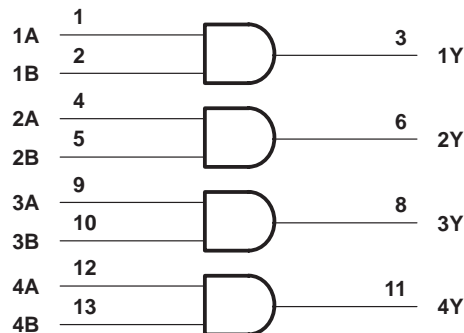


NC – No internal connection

## logic symbol†



## logic diagram (positive logic)



† This symbol is in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

Pin numbers shown are for the D, J, and N packages.

# SN54ALS08, SN54AS08, SN74ALS08, SN74AS08 QUADRUPLE 2-INPUT POSITIVE-AND GATES

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## absolute maximum ratings over operating free-air temperature range (unless otherwise noted)†

|                                                         |                |
|---------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$                                | 7 V            |
| Input voltage, $V_I$                                    | 7 V            |
| Operating free-air temperature range, $T_A$ : SN54ALS08 | -55°C to 125°C |
| SN74ALS08                                               | 0°C to 70°C    |
| Storage temperature range                               | -65°C to 150°C |

† 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

|          |                                | SN54ALS08 |     |      | SN74ALS08 |     |      | 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        |           |     | 0.8‡ |           |     | 0.8  | V    |
|          |                                |           |     | 0.7§ |           |     |      |      |
| $I_{OH}$ | High-level output current      |           |     | -0.4 |           |     | -0.4 | mA   |
| $I_{OL}$ | Low-level output current       |           |     | 4    |           |     | 8    | mA   |
| $T_A$    | Operating free-air temperature | -55       |     | 125  | 0         |     | 70   | °C   |

‡ Applies over temperature range -55°C to 70°C

§ Applies over temperature range 70°C to 125°C

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

| PARAMETER    | TEST CONDITIONS                                     | SN54ALS08       |       |      | SN74ALS08    |       |      | UNIT |
|--------------|-----------------------------------------------------|-----------------|-------|------|--------------|-------|------|------|
|              |                                                     | MIN             | TYP†† | MAX  | MIN          | TYP†† | MAX  |      |
| $V_{IK}$     | $V_{CC} = 4.5 V$ ,<br>$I_I = -18 mA$                |                 |       | -1.5 |              |       | -1.5 | V    |
| $V_{OH}$     | $V_{CC} = 4.5 V$ to $5.5 V$ ,<br>$I_{OH} = -0.4 mA$ | $V_{CC} - 2$    |       |      | $V_{CC} - 2$ |       |      | V    |
| $V_{OL}$     | $V_{CC} = 4.5 V$                                    |                 | 0.25  | 0.4  |              | 0.25  | 0.4  | V    |
|              |                                                     | $I_{OL} = 4 mA$ |       |      |              | 0.35  | 0.5  |      |
| $I_I$        | $V_{CC} = 5.5 V$ ,<br>$V_I = 7 V$                   |                 |       | 0.1  |              |       | 0.1  | mA   |
| $I_{IH}$     | $V_{CC} = 5.5 V$ ,<br>$V_I = 2.7 V$                 |                 |       | 20   |              |       | 20   | μA   |
| $I_{IL}$     | $V_{CC} = 5.5 V$ ,<br>$V_I = 0.4 V$                 |                 |       | -0.1 |              |       | -0.1 | mA   |
| $I_{O}^{\#}$ | $V_{CC} = 5.5 V$ ,<br>$V_O = 2.25 V$                | -20             |       | -112 | -30          |       | -112 | mA   |
| $I_{CCH}$    | $V_{CC} = 5.5 V$ ,<br>$V_I = 4.5 V$                 |                 | 1.3   | 2.4  |              | 1.3   | 2.4  | mA   |
| $I_{CCL}$    | $V_{CC} = 5.5 V$ ,<br>$V_I = 0$                     |                 | 2.2   | 4    |              | 2.2   | 4    | mA   |

†† All typical values are at  $V_{CC} = 5 V$ ,  $T_A = 25°C$ .

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



# SN54ALS08, SN54AS08, SN74ALS08, SN74AS08 QUADRUPLE 2-INPUT POSITIVE-AND GATES

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## switching characteristics (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 4.5\text{ V to }5.5\text{ V},$<br>$C_L = 50\text{ pF},$<br>$R_L = 500\ \Omega,$<br>$T_A = \text{MIN to MAX}^\dagger$ |      |           |     | UNIT |
|-----------|-----------------|----------------|--------------------------------------------------------------------------------------------------------------------------------|------|-----------|-----|------|
|           |                 |                | SN54ALS08                                                                                                                      |      | SN74ALS08 |     |      |
|           |                 |                | MIN                                                                                                                            | MAX  | MIN       | MAX |      |
| $t_{PLH}$ | A or B          | Y              | 2                                                                                                                              | 14   | 4         | 14  | ns   |
| $t_{PHL}$ |                 |                | 2                                                                                                                              | 12.5 | 3         | 10  |      |

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

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

|                                                        |                |
|--------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$                               | 7 V            |
| Input voltage, $V_I$                                   | 7 V            |
| Operating free-air temperature range, $T_A$ : SN54AS08 | -55°C to 125°C |
| SN74AS08                                               | 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

|                                      | SN54AS08 |     |     | SN74AS08 |     |     | 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     |          |     | 0.8 |          |     | 0.8 | V    |
| $I_{OH}$ High-level output current   |          |     | -2  |          |     | -2  | mA   |
| $I_{OL}$ Low-level output current    |          |     | 20  |          |     | 20  | mA   |
| $T_A$ Operating free-air temperature | -55      |     | 125 | 0        |     | 70  | °C   |

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

| PARAMETER           | TEST CONDITIONS                                                     | SN54AS08     |                  |      | SN74AS08     |                  |      | UNIT |
|---------------------|---------------------------------------------------------------------|--------------|------------------|------|--------------|------------------|------|------|
|                     |                                                                     | MIN          | TYP <sup>§</sup> | MAX  | MIN          | TYP <sup>§</sup> | MAX  |      |
| $V_{IK}$            | $V_{CC} = 4.5\text{ V},$<br>$I_I = -18\text{ mA}$                   |              |                  | -1.2 |              |                  | -1.2 | V    |
| $V_{OH}$            | $V_{CC} = 4.5\text{ V to }5.5\text{ V},$<br>$I_{OH} = -2\text{ mA}$ | $V_{CC} - 2$ |                  |      | $V_{CC} - 2$ |                  |      | V    |
| $V_{OL}$            | $V_{CC} = 4.5\text{ V},$<br>$I_{OL} = 20\text{ mA}$                 | 0.35         | 0.5              |      | 0.35         | 0.5              |      | V    |
| $I_I$               | $V_{CC} = 5.5\text{ V},$<br>$V_I = 7\text{ V}$                      |              | 0.1              |      |              | 0.1              |      | mA   |
| $I_{IH}$            | $V_{CC} = 5.5\text{ V},$<br>$V_I = 2.7\text{ V}$                    |              | 20               |      |              | 20               |      | μA   |
| $I_{IL}$            | $V_{CC} = 5.5\text{ V},$<br>$V_I = 0.4\text{ V}$                    |              | -0.5             |      |              | -0.5             |      | mA   |
| $I_{O}^{\parallel}$ | $V_{CC} = 5.5\text{ V},$<br>$V_O = 2.25\text{ V}$                   | -30          | -112             |      | -30          | -112             |      | mA   |
| $I_{CCH}$           | $V_{CC} = 5.5\text{ V},$<br>$V_I = 4.5\text{ V}$                    |              | 5.8              | 9.3  |              | 5.8              | 9.3  | mA   |
| $I_{CCL}$           | $V_{CC} = 5.5\text{ V},$<br>$V_I = 0$                               |              | 14.9             | 24   |              | 14.9             | 24   | mA   |

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

<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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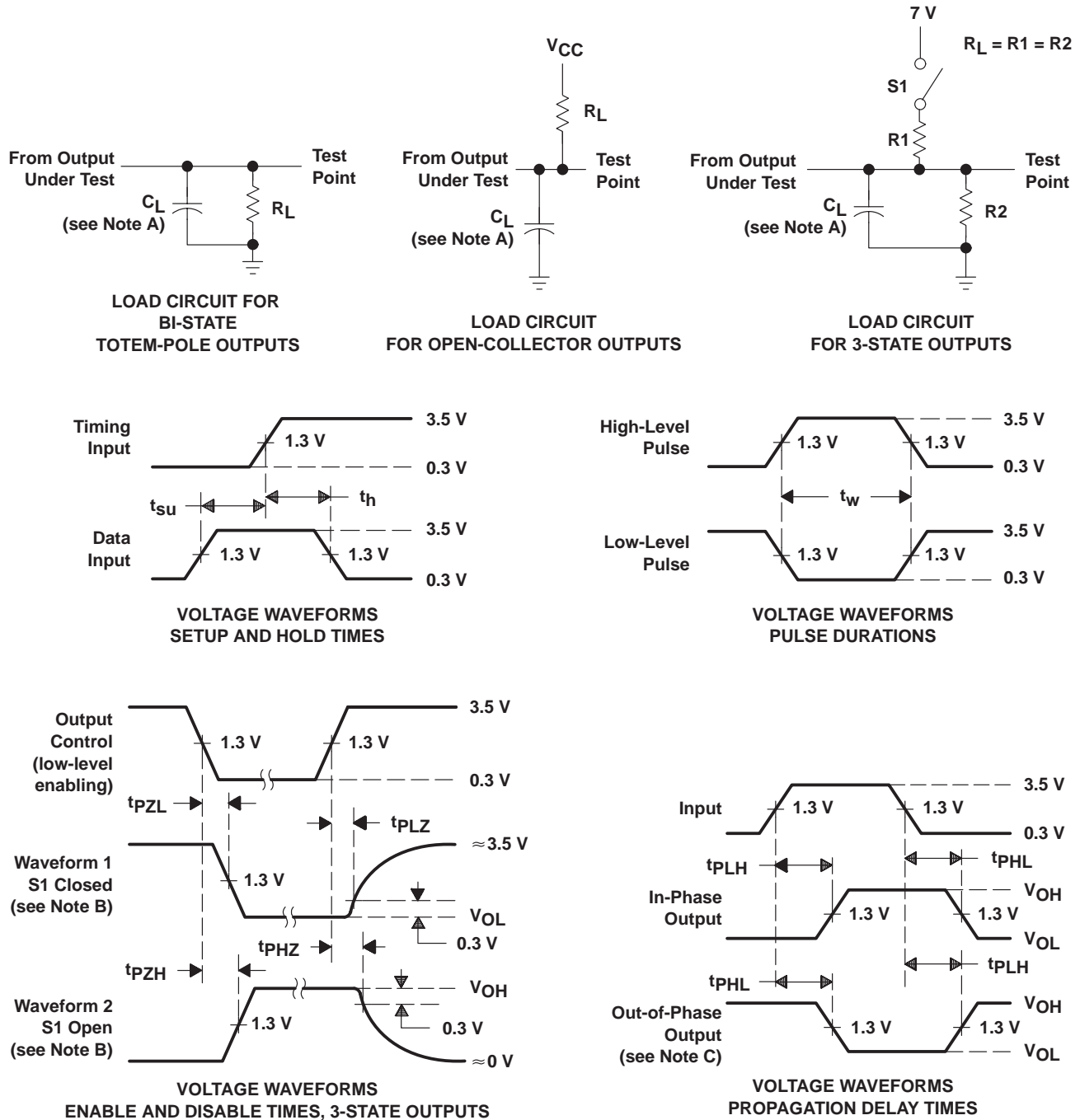
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## switching characteristics (see Figure 1)

| PARAMETER | FROM<br>(INPUT) | TO<br>(OUTPUT) | $V_{CC} = 4.5 \text{ V to } 5.5 \text{ V},$<br>$C_L = 50 \text{ pF},$<br>$R_L = 500 \Omega,$<br>$T_A = \text{MIN to MAX}^\dagger$ |     |          |     | UNIT |
|-----------|-----------------|----------------|-----------------------------------------------------------------------------------------------------------------------------------|-----|----------|-----|------|
|           |                 |                | SN54AS08                                                                                                                          |     | SN74AS08 |     |      |
|           |                 |                | MIN                                                                                                                               | MAX | MIN      | MAX |      |
| $t_{PLH}$ | A or B          | Y              | 1                                                                                                                                 | 6.5 | 1        | 5.5 | ns   |
| $t_{PHL}$ |                 |                | 1                                                                                                                                 | 6.5 | 1        | 5.5 |      |

<sup>†</sup> For conditions shown as MIN or MAX, use the appropriate value specified under recommended operating conditions.

PARAMETER MEASUREMENT INFORMATION  
 SERIES 54ALS/74ALS AND 54AS/74AS DEVICES



- 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. When measuring propagation delay items of 3-state outputs, switch S1 is open.  
 D. All input pulses have the following characteristics:  $PRR \leq 1$  MHz,  $t_r = t_f = 2$  ns, duty cycle = 50%.  
 E. The outputs are measured one at a time with one transition per measurement.

Figure 1. Load Circuits and Voltage Waveforms

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup>               |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--------------------------------------------|
| 5962-86842012A   | ACTIVE                | LCCC         | FK              | 20   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| 5962-8684201CA   | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| 5962-8684201DA   | ACTIVE                | CFP          | W               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| JM38510/37401B2A | ACTIVE                | LCCC         | FK              | 20   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| JM38510/37401BCA | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SN54ALS08J       | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SN54AS08J        | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SN74ALS08D       | ACTIVE                | SOIC         | D               | 14   | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74ALS08DR      | ACTIVE                | SOIC         | D               | 14   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74ALS08N       | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| SN74ALS08N3      | OBSOLETE              | PDIP         | N               | 14   |             | None                    | Call TI          | Call TI                                    |
| SN74ALS08NSR     | ACTIVE                | SO           | NS              | 14   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AS08D        | ACTIVE                | SOIC         | D               | 14   | 50          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AS08DR       | ACTIVE                | SOIC         | D               | 14   | 2500        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AS08N        | ACTIVE                | PDIP         | N               | 14   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| SN74AS08N3       | OBSOLETE              | PDIP         | N               | 14   |             | None                    | Call TI          | Call TI                                    |
| SN74AS08NSR      | ACTIVE                | SO           | NS              | 14   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SNJ54ALS08FK     | ACTIVE                | LCCC         | FK              | 20   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54ALS08J      | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54ALS08W      | ACTIVE                | CFP          | W               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54AS08FK      | ACTIVE                | LCCC         | FK              | 20   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54AS08J       | ACTIVE                | CDIP         | J               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |
| SNJ54AS08W       | ACTIVE                | CFP          | W               | 14   | 1           | None                    | Call TI          | Level-NC-NC-NC                             |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - May not be currently available - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**None:** Not yet available Lead (Pb-Free).

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean "Pb-Free" and in addition, uses package materials that do not contain halogens, including bromine (Br) or antimony (Sb) above 0.1% of total product weight.

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

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| Data Converters  | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>     | Automotive          | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>         |
| DSP              | <a href="http://dsp.ti.com">dsp.ti.com</a>                         | Broadband           | <a href="http://www.ti.com/broadband">www.ti.com/broadband</a>           |
| Interface        | <a href="http://interface.ti.com">interface.ti.com</a>             | Digital Control     | <a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a> |
| Logic            | <a href="http://logic.ti.com">logic.ti.com</a>                     | Military            | <a href="http://www.ti.com/military">www.ti.com/military</a>             |
| Power Mgmt       | <a href="http://power.ti.com">power.ti.com</a>                     | Optical Networking  | <a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a> |
| Microcontrollers | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a> | Security            | <a href="http://www.ti.com/security">www.ti.com/security</a>             |
|                  |                                                                    | Telephony           | <a href="http://www.ti.com/telephony">www.ti.com/telephony</a>           |
|                  |                                                                    | Video & Imaging     | <a href="http://www.ti.com/video">www.ti.com/video</a>                   |
|                  |                                                                    | Wireless            | <a href="http://www.ti.com/wireless">www.ti.com/wireless</a>             |

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