

# SN54AHC245, SN74AHC245 OCTAL BUS TRANSCEIVERS WITH 3-STATE OUTPUTS

SCLS230I – OCTOBER 1995 – REVISED JULY 2003

- Operating Range 2-V to 5.5-V  $V_{CC}$
- Latch-Up Performance Exceeds 250 mA Per JESD 17

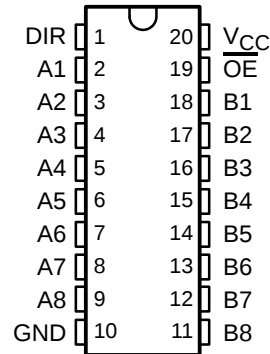
## description/ordering information

The 'AHC245 octal bus transceivers are designed for asynchronous two-way communication between data buses. The control-function implementation minimizes external timing requirements.

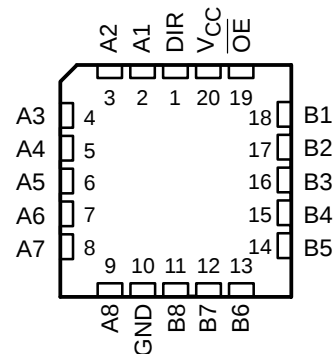
These devices allow data transmission from the A bus to the B bus or from the B bus to the A bus, depending on the logic level at the direction-control (DIR) input. The output-enable ( $\overline{OE}$ ) input can be used to disable the device so that the buses are effectively isolated.

To ensure the high-impedance state during power up or power down,  $\overline{OE}$  should be tied to  $V_{CC}$  through a pullup resistor; the minimum value of the resistor is determined by the current-sinking capability of the driver.

SN54AHC245 . . . J OR W PACKAGE  
SN74AHC245 . . . DB, DGV, DW, N, OR PW PACKAGE  
(TOP VIEW)



SN54AHC245 . . . FK PACKAGE  
(TOP VIEW)



## ORDERING INFORMATION

| $T_A$          | PACKAGE†    |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-------------|---------------|-----------------------|------------------|
| -40°C to 85°C  | PDIP – N    | Tube          | SN74AHC245N           | AHC245           |
|                |             | Tape and reel | SN74AHC245DWR         |                  |
|                | SOIC – DW   | Tube          | SN74AHC245DW          | HA245            |
|                |             | Tape and reel | SN74AHC245DWR         |                  |
|                | SSOP – DB   | Tape and reel | SN74AHC245DBR         | HA245            |
|                | TSSOP – PW  | Tube          | SN74AHC245PW          | HA245            |
|                |             | Tape and reel | SN74AHC245PWR         |                  |
| -55°C to 125°C | TVSOP – DGV | Tape and reel | SN74AHC245DGV         | HA245            |
|                | CDIP – J    | Tube          | SNJ54AHC245J          | SNJ54AHC245J     |
|                | CFP – W     | Tube          | SNJ54AHC245W          | SNJ54AHC245W     |
|                | LCCC – FK   | Tube          | SNJ54AHC245FK         | SNJ54AHC245FK    |

† Package drawings, standard packing quantities, thermal data, symbolization, and PCB design guidelines are available at [www.ti.com/sc/package](http://www.ti.com/sc/package).



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PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

**TEXAS  
INSTRUMENTS**

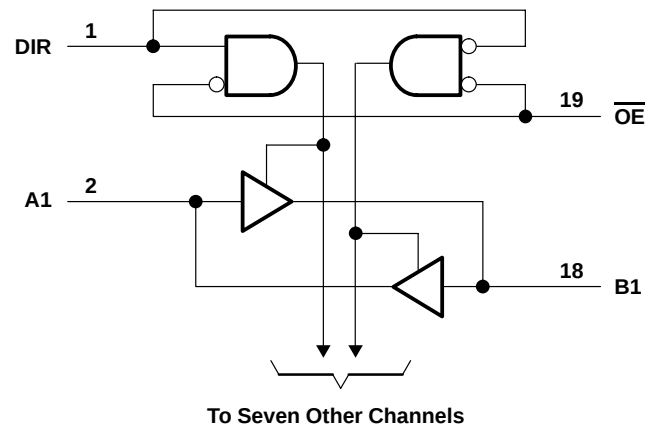
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On products compliant to MIL-PRF-38535, all parameters are tested unless otherwise noted. On all other products, production processing does not necessarily include testing of all parameters.

FUNCTION TABLE  
(each transceiver)

| INPUTS          |     | OPERATION       |
|-----------------|-----|-----------------|
| $\overline{OE}$ | DIR |                 |
| L               | L   | B data to A bus |
| L               | H   | A data to B bus |
| H               | X   | Isolation       |

logic diagram (positive logic)



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

|                                                                     |                            |
|---------------------------------------------------------------------|----------------------------|
| Supply voltage range, $V_{CC}$                                      | –0.5 V to 7 V              |
| Input voltage range, $V_I$ (see Note 1): Control inputs             | –0.5 V to 7 V              |
| I/O, Output voltage range, $V_O$ (see Note 1)                       | –0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ ): Control inputs         | –20 mA                     |
| I/O, Output clamp current, $I_{OK}$ ( $V_O < 0$ or $V_O > V_{CC}$ ) | ±20 mA                     |
| Continuous output current, $I_O$ ( $V_O = 0$ to $V_{CC}$ )          | ±25 mA                     |
| Continuous current through $V_{CC}$ or GND                          | ±75 mA                     |
| Package thermal impedance, $\theta_{JA}$ (see Note 2): DB package   | 70°C/W                     |
| DGV package                                                         | 92°C/W                     |
| DW package                                                          | 58°C/W                     |
| N package                                                           | 69°C/W                     |
| PW package                                                          | 83°C/W                     |
| Storage temperature range, $T_{stg}$                                | –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.

NOTES: 1. The input and output voltage ratings may be exceeded if the input and output current ratings are observed.

2. The package thermal impedance is calculated in accordance with JESD 51-7.

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## recommended operating conditions (see Note 3)

|                 |                                    |                                 | SN54AHC245 |                 | SN74AHC245 |                 | UNIT |
|-----------------|------------------------------------|---------------------------------|------------|-----------------|------------|-----------------|------|
|                 |                                    |                                 | MIN        | MAX             | MIN        | MAX             |      |
| V <sub>CC</sub> | Supply voltage                     |                                 | 2          | 5.5             | 2          | 5.5             | V    |
| V <sub>IH</sub> | High-level input voltage           | V <sub>CC</sub> = 2 V           | 1.5        |                 | 1.5        |                 | V    |
|                 |                                    | V <sub>CC</sub> = 3 V           | 2.1        |                 | 2.1        |                 |      |
|                 |                                    | V <sub>CC</sub> = 5.5 V         | 3.85       |                 | 3.85       |                 |      |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 2 V           | 0.5        |                 | 0.5        |                 | V    |
|                 |                                    | V <sub>CC</sub> = 3 V           | 0.9        |                 | 0.9        |                 |      |
|                 |                                    | V <sub>CC</sub> = 5.5 V         | 1.65       |                 | 1.65       |                 |      |
| V <sub>I</sub>  | Input voltage                      | $\overline{\text{OE}}$ or DIR   | 0          | 5.5             | 0          | 5.5             | V    |
| V <sub>O</sub>  | Output voltage                     | A or B                          | 0          | V <sub>CC</sub> | 0          | V <sub>CC</sub> | V    |
| I <sub>OH</sub> | High-level output current          | V <sub>CC</sub> = 2 V           | −50        |                 | −50        |                 | μA   |
|                 |                                    | V <sub>CC</sub> = 3.3 V ± 0.3 V | −4         |                 | −4         |                 | mA   |
|                 |                                    | V <sub>CC</sub> = 5 V ± 0.5 V   | −8         |                 | −8         |                 |      |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 2 V           | 50         |                 | 50         |                 | μA   |
|                 |                                    | V <sub>CC</sub> = 3.3 V ± 0.3 V | 4          |                 | 4          |                 | mA   |
|                 |                                    | V <sub>CC</sub> = 5 V ± 0.5 V   | 8          |                 | 8          |                 |      |
| Δt/Δv           | Input transition rise or fall rate | V <sub>CC</sub> = 3.3 V ± 0.3 V | 100        |                 | 100        |                 | ns/V |
|                 |                                    | V <sub>CC</sub> = 5 V ± 0.5 V   | 20         |                 | 20         |                 |      |
| T <sub>A</sub>  | Operating free-air temperature     |                                 | −55        | 125             | −40        | 85              | °C   |

NOTE 3: All unused inputs of the device must be held at V<sub>CC</sub> or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.

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

| PARAMETER                    |                               | TEST CONDITIONS                                                                                                         | V <sub>CC</sub> | T <sub>A</sub> = 25°C |     |       | SN54AHC245 |      | SN74AHC245 |      | UNIT |
|------------------------------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------|-----------------|-----------------------|-----|-------|------------|------|------------|------|------|
|                              |                               |                                                                                                                         |                 | MIN                   | TYP | MAX   | MIN        | MAX  | MIN        | MAX  |      |
| V <sub>OH</sub>              |                               | I <sub>OH</sub> = –50 μA                                                                                                | 2 V             | 1.9                   | 2   |       | 1.9        |      | 1.9        |      | V    |
|                              |                               |                                                                                                                         | 3 V             | 2.9                   | 3   |       | 2.9        |      | 2.9        |      |      |
|                              |                               |                                                                                                                         | 4.5 V           | 4.4                   | 4.5 |       | 4.4        |      | 4.4        |      |      |
|                              |                               | I <sub>OH</sub> = –4 mA                                                                                                 | 3 V             | 2.58                  |     |       | 2.48       |      | 2.48       |      |      |
|                              |                               |                                                                                                                         | 4.5 V           | 3.94                  |     |       | 3.8        |      | 3.8        |      |      |
| V <sub>OL</sub>              |                               | I <sub>OL</sub> = 50 μA                                                                                                 | 2 V             |                       |     | 0.1   |            | 0.1  |            | 0.1  | V    |
|                              |                               |                                                                                                                         | 3 V             |                       |     | 0.1   |            | 0.1  |            | 0.1  |      |
|                              |                               |                                                                                                                         | 4.5 V           |                       |     | 0.1   |            | 0.1  |            | 0.1  |      |
|                              |                               | I <sub>OL</sub> = 4 mA                                                                                                  | 3 V             |                       |     | 0.36  |            | 0.5  |            | 0.44 |      |
|                              |                               |                                                                                                                         | 4.5 V           |                       |     | 0.36  |            | 0.5  |            | 0.44 |      |
| I <sub>I</sub>               | A or B inputs                 | V <sub>I</sub> = V <sub>CC</sub> or GND                                                                                 | 5.5 V           |                       |     | ±0.1  |            | ±1   |            | ±1   | μA   |
|                              | $\overline{\text{OE}}$ or DIR |                                                                                                                         | 0 V to 5.5 V    |                       |     | ±0.1  |            | ±1*  |            | ±1   |      |
| I <sub>OZ</sub> <sup>†</sup> |                               | V <sub>O</sub> = V <sub>CC</sub> or GND, V <sub>I</sub> ( $\overline{\text{OE}}$ ) = V <sub>IL</sub> or V <sub>IH</sub> | 5.5 V           |                       |     | ±0.25 |            | ±2.5 |            | ±2.5 | μA   |
| I <sub>CC</sub>              |                               | V <sub>I</sub> = V <sub>CC</sub> or GND, I <sub>O</sub> = 0                                                             | 5.5 V           |                       |     | 4     |            | 40   |            | 40   | μA   |
| C <sub>i</sub>               | $\overline{\text{OE}}$ or DIR | V <sub>I</sub> = V <sub>CC</sub> or GND                                                                                 | 5 V             |                       | 2.5 | 10    |            |      |            | 10   | pF   |
| C <sub>io</sub>              | A or B inputs                 | V <sub>I</sub> = V <sub>CC</sub> or GND                                                                                 | 5 V             |                       | 4   |       |            |      |            |      | pF   |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested at V<sub>CC</sub> = 0 V.

† The parameter I<sub>OZ</sub> includes the input leakage current.



# SN54AHC245, SN74AHC245

## OCTAL BUS TRANSCEIVERS

### WITH 3-STATE OUTPUTS

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switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 3.3\text{ V} \pm 0.3\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER          | FROM<br>(INPUT) | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE    | T <sub>A</sub> = 25°C |        |     | SN54AHC245 |     | SN74AHC245 |     | UNIT |
|--------------------|-----------------|----------------|------------------------|-----------------------|--------|-----|------------|-----|------------|-----|------|
|                    |                 |                |                        | MIN                   | TYP    | MAX | MIN        | MAX | MIN        | MAX |      |
| t <sub>PLH</sub>   | A or B          | B or A         | C <sub>L</sub> = 15 pF | 5.8**                 | 8.4**  | 1** | 10**       | 1   | 10         | ns  |      |
| t <sub>PHL</sub>   |                 |                |                        | 5.8**                 | 8.4**  | 1** | 10**       | 1   | 10         |     |      |
| t <sub>PZH</sub>   | OE              | A or B         | C <sub>L</sub> = 15 pF | 8.5**                 | 13.2** | 1** | 15.5**     | 1   | 15.5       | ns  |      |
| t <sub>PZL</sub>   |                 |                |                        | 8.5**                 | 13.2** | 1** | 15.5**     | 1   | 15.5       |     |      |
| t <sub>PHZ</sub>   | OE              | A or B         | C <sub>L</sub> = 15 pF | 8.9**                 | 12.5** | 1** | 15.5**     | 1   | 15.5       | ns  |      |
| t <sub>PLZ</sub>   |                 |                |                        | 8.9**                 | 12.5** | 1** | 15.5**     | 1   | 15.5       |     |      |
| t <sub>PLH</sub>   | A or B          | B or A         | C <sub>L</sub> = 50 pF | 8.3                   | 11.9   | 1   | 13.5       | 1   | 13.5       | ns  |      |
| t <sub>PHL</sub>   |                 |                |                        | 8.3                   | 11.9   | 1   | 13.5       | 1   | 13.5       |     |      |
| t <sub>PZH</sub>   | OE              | A or B         | C <sub>L</sub> = 50 pF | 11                    | 16.7   | 1   | 19         | 1   | 19         | ns  |      |
| t <sub>PZL</sub>   |                 |                |                        | 11                    | 16.7   | 1   | 19         | 1   | 19         |     |      |
| t <sub>PHZ</sub>   | OE              | A or B         | C <sub>L</sub> = 50 pF | 11.5                  | 15.8   | 1   | 18         | 1   | 18         | ns  |      |
| t <sub>PLZ</sub>   |                 |                |                        | 11.5                  | 15.8   | 1   | 18         | 1   | 18         |     |      |
| t <sub>sk(o)</sub> |                 |                | C <sub>L</sub> = 50 pF | 1.5***                |        |     |            | 1.5 |            | ns  |      |

\*\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

\*\*\* On products compliant to MIL-PRF-38535, this parameter does not apply.

switching characteristics over recommended operating free-air temperature range,  
 $V_{CC} = 5\text{ V} \pm 0.5\text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER          | FROM<br>(INPUT) | TO<br>(OUTPUT) | LOAD<br>CAPACITANCE    | T <sub>A</sub> = 25°C |      |     | SN54AHC245 |     | SN74AHC245 |     | UNIT |
|--------------------|-----------------|----------------|------------------------|-----------------------|------|-----|------------|-----|------------|-----|------|
|                    |                 |                |                        | MIN                   | TYP  | MAX | MIN        | MAX | MIN        | MAX |      |
| t <sub>PLH</sub>   | A or B          | B or A         | C <sub>L</sub> = 15 pF | 4*                    | 5.5* | 1*  | 6.5*       | 1   | 6.5        | ns  |      |
| t <sub>PHL</sub>   |                 |                |                        | 4*                    | 5.5* | 1*  | 6.5*       | 1   | 6.5        |     |      |
| t <sub>PZH</sub>   | $\overline{OE}$ | A or B         | C <sub>L</sub> = 15 pF | 5.8*                  | 8.5* | 1*  | 10*        | 1   | 10         | ns  |      |
| t <sub>PZL</sub>   |                 |                |                        | 5.8*                  | 8.5* | 1*  | 10*        | 1   | 10         |     |      |
| t <sub>PHZ</sub>   | $\overline{OE}$ | A or B         | C <sub>L</sub> = 15 pF | 5.6*                  | 7.8* | 1*  | 9.2*       | 1   | 9.2        | ns  |      |
| t <sub>PLZ</sub>   |                 |                |                        | 5.6*                  | 7.8* | 1*  | 9.2*       | 1   | 9.2        |     |      |
| t <sub>PLH</sub>   | A or B          | B or A         | C <sub>L</sub> = 50 pF | 5.5                   | 7.5  | 1   | 8.5        | 1   | 8.5        | ns  |      |
| t <sub>PHL</sub>   |                 |                |                        | 5.5                   | 7.5  | 1   | 8.5        | 1   | 8.5        |     |      |
| t <sub>PZH</sub>   | $\overline{OE}$ | A or B         | C <sub>L</sub> = 50 pF | 7.3                   | 10.6 | 1   | 12         | 1   | 12         | ns  |      |
| t <sub>PZL</sub>   |                 |                |                        | 7.3                   | 10.6 | 1   | 12         | 1   | 12         |     |      |
| t <sub>PHZ</sub>   | $\overline{OE}$ | A or B         | C <sub>L</sub> = 50 pF | 7                     | 9.7  | 1   | 11         | 1   | 11         | ns  |      |
| t <sub>PLZ</sub>   |                 |                |                        | 7                     | 9.7  | 1   | 11         | 1   | 11         |     |      |
| t <sub>sk(o)</sub> |                 |                | C <sub>L</sub> = 50 pF |                       | 1**  |     |            |     | 1          | ns  |      |

\* On products compliant to MIL-PRF-38535, this parameter is not production tested.

\*\* On products compliant to MIL-PRF-38535, this parameter does not apply.



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noise characteristics,  $V_{CC} = 5\text{ V}$ ,  $C_L = 50\text{ pF}$ ,  $T_A = 25^\circ\text{C}$  (see Note 4)

| PARAMETER                                          | SN74AHC245 |      |     | UNIT |
|----------------------------------------------------|------------|------|-----|------|
|                                                    | MIN        | TYP  | MAX |      |
| $V_{OL(P)}$ Quiet output, maximum dynamic $V_{OL}$ |            | 0.9  |     | V    |
| $V_{OL(V)}$ Quiet output, minimum dynamic $V_{OL}$ |            | –0.9 |     | V    |
| $V_{OH(V)}$ Quiet output, minimum dynamic $V_{OH}$ |            | 4.3  |     | V    |
| $V_{IH(D)}$ High-level dynamic input voltage       |            | 3.5  |     | V    |
| $V_{IL(D)}$ Low-level dynamic input voltage        |            |      | 1.5 | V    |

NOTE 4: Characteristics are for surface-mount packages only.

operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER                              | TEST CONDITIONS             | TYP | UNIT |
|----------------------------------------|-----------------------------|-----|------|
| $C_{pd}$ Power dissipation capacitance | No load, $f = 1\text{ MHz}$ | 14  | pF   |



**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>               |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|--------------------------------------------|
| 5962-9681801Q2A  | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| 5962-9681801QRA  | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| 5962-9681801QSA  | ACTIVE                | CFP          | W               | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| 5962-9681801VRA  | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| 5962-9681801VSA  | ACTIVE                | CFP          | W               | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| SN74AHC245DBLE   | OBSOLETE              | SSOP         | DB              | 20   |             | TBD                     | Call TI          | Call TI                                    |
| SN74AHC245DBR    | ACTIVE                | SSOP         | DB              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AHC245DBRE4  | ACTIVE                | SSOP         | DB              | 20   | 2000        | TBD                     | Call TI          | Call TI                                    |
| SN74AHC245DGV    | ACTIVE                | TVSOP        | DGV             | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SN74AHC245DGVRE4 | ACTIVE                | TVSOP        | DGV             | 20   | 2000        | TBD                     | Call TI          | Call TI                                    |
| SN74AHC245DW     | ACTIVE                | SOIC         | DW              | 20   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AHC245DWR    | ACTIVE                | SOIC         | DW              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-250C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AHC245N      | ACTIVE                | PDIP         | N               | 20   | 20          | Pb-Free (RoHS)          | CU NIPDAU        | Level-NC-NC-NC                             |
| SN74AHC245NSR    | ACTIVE                | SO           | NS              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-2-260C-1 YEAR/<br>Level-1-235C-UNLIM |
| SN74AHC245PW     | ACTIVE                | TSSOP        | PW              | 20   | 70          | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SN74AHC245PWE4   | ACTIVE                | TSSOP        | PW              | 20   | 70          | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SN74AHC245PWLE   | OBSOLETE              | TSSOP        | PW              | 20   |             | TBD                     | Call TI          | Call TI                                    |
| SN74AHC245PWR    | ACTIVE                | TSSOP        | PW              | 20   | 2000        | Pb-Free (RoHS)          | CU NIPDAU        | Level-1-250C-UNLIM                         |
| SN74AHC245PWGR4  | ACTIVE                | TSSOP        | PW              | 20   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM                         |
| SNJ54AHC245FK    | ACTIVE                | LCCC         | FK              | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| SNJ54AHC245J     | ACTIVE                | CDIP         | J               | 20   | 1           | TBD                     | Call TI          | Level-NC-NC-NC                             |
| SNJ54AHC245W     | ACTIVE                | CFP          | W               | 20   | 1           | TBD                     | 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 - The planned eco-friendly classification: Pb-Free (RoHS) or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**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 (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)