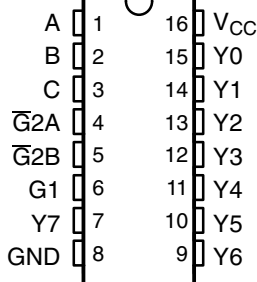


# SN54AHC138, SN74AHC138 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

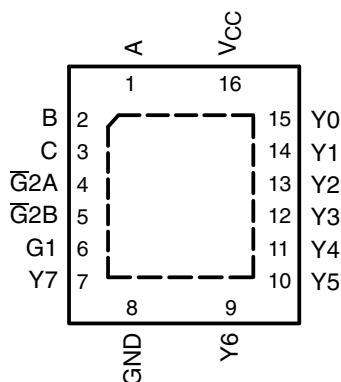
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- Operating Range 2-V to 5.5-V  $V_{CC}$
- Designed Specifically for High-Speed Memory Decoders and Data-Transmission Systems
- Incorporate Three Enable Inputs to Simplify Cascading and/or Data Reception
- Latch-Up Performance Exceeds 250 mA Per JESD 17
- ESD Protection Exceeds JESD 22
  - 2000-V Human-Body Model (A114-A)
  - 200-V Machine Model (A115-A)
  - 1000-V Charged-Device Model (C101)

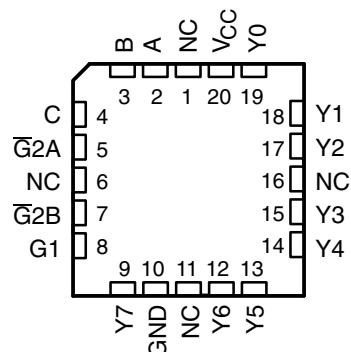
SN54AHC138 . . . J OR W PACKAGE  
SN74AHC138 . . . D, DB, DGV, N, NS,  
OR PW PACKAGE  
(TOP VIEW)



SN74AHC138 . . . RGY PACKAGE  
(TOP VIEW)



SN54AHC138 . . . FK PACKAGE  
(TOP VIEW)



NC – No internal connection

## description/ordering information

The 'AHC138 decoders/demultiplexers are designed for high-performance memory-decoding and data-routing applications that require very short propagation-delay times. In high-performance memory systems, these decoders can be used to minimize the effects of system decoding. When employed with high-speed memories utilizing a fast enable circuit, the delay times of these decoders and the enable time of the memory usually are less than the typical access time of the memory. This means that the effective system delay introduced by the decoders is negligible.

## ORDERING INFORMATION

| $T_A$          | PACKAGE†    |               | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|-------------|---------------|-----------------------|------------------|
| –40°C to 85°C  | QFN – RGY   | Tape and reel | SN74AHC138RGYR        | HA138            |
|                | PDIP – N    | Tube          | SN74AHC138N           | SN74AHC138N      |
|                | SOIC – D    | Tube          | SN74AHC138D           | AHC138           |
|                |             | Tape and reel | SN74AHC138DR          |                  |
|                | SOP – NS    | Tape and reel | SN74AHC138NSR         | AHC138           |
|                | SSOP – DB   | Tape and reel | SN74AHC138DBR         | HA138            |
|                | TSSOP – PW  | Tube          | SN74AHC138PW          | HA138            |
|                |             | Tape and reel | SN74AHC138PWR         |                  |
| –55°C to 125°C | TVSOP – DGV | Tape and reel | SN74AHC138DGV         | HA138            |
|                | CDIP – J    | Tube          | SNJ54AHC138J          | SNJ54AHC138J     |
|                | CFP – W     | Tube          | SNJ54AHC138W          | SNJ54AHC138W     |
|                | LCCC – FK   | Tube          | SNJ54AHC138FK         | SNJ54AHC138FK    |

† 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).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

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  
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# SN54AHC138, SN74AHC138

## 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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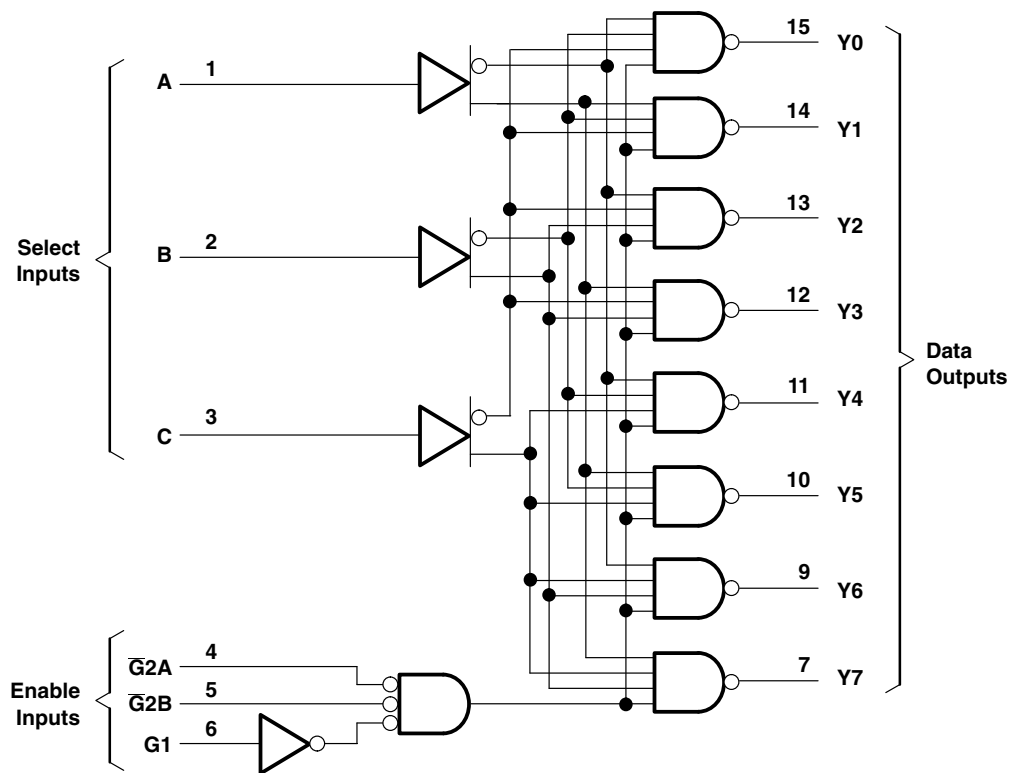
### description/ordering information (continued)

The conditions at the binary-select inputs and the three enable inputs select one of eight output lines. Two active-low and one active-high enable inputs reduce the need for external gates or inverters when expanding. A 24-line decoder can be implemented without external inverters, and a 32-line decoder requires only one inverter. An enable input can be used as a data input for demultiplexing applications.

FUNCTION TABLE

| ENABLE INPUTS |     |     | SELECT INPUTS |   |   | OUTPUTS |    |    |    |    |    |    |    |
|---------------|-----|-----|---------------|---|---|---------|----|----|----|----|----|----|----|
| G1            | G2A | G2B | C             | B | A | Y0      | Y1 | Y2 | Y3 | Y4 | Y5 | Y6 | Y7 |
| X             | H   | X   | X             | X | X | H       | H  | H  | H  | H  | H  | H  | H  |
| X             | X   | H   | X             | X | X | H       | H  | H  | H  | H  | H  | H  | H  |
| L             | X   | X   | X             | X | X | H       | H  | H  | H  | H  | H  | H  | H  |
| H             | L   | L   | L             | L | L | L       | H  | H  | H  | H  | H  | H  | H  |
| H             | L   | L   | L             | L | H | H       | L  | H  | H  | H  | H  | H  | H  |
| H             | L   | L   | L             | H | L | H       | H  | L  | H  | H  | H  | H  | H  |
| H             | L   | L   | L             | H | H | H       | H  | L  | H  | H  | H  | H  | H  |
| H             | L   | L   | H             | L | L | H       | H  | H  | H  | L  | H  | H  | H  |
| H             | L   | L   | H             | L | H | H       | H  | H  | H  | H  | L  | H  | H  |
| H             | L   | L   | H             | H | L | H       | H  | H  | H  | H  | H  | L  | H  |
| H             | L   | L   | H             | H | H | H       | H  | H  | H  | H  | H  | H  | L  |

### logic diagram (positive logic)



Pin numbers shown are for the D, DB, DGV, J, N, NS, PW, RGY, and W packages.

# SN54AHC138, SN74AHC138

## 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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### 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)                          | –0.5 V to 7 V              |
| Output voltage range, $V_O$ (see Note 1)                         | –0.5 V to $V_{CC} + 0.5$ V |
| Input clamp current, $I_{IK}$ ( $V_I < 0$ )                      | –20 mA                     |
| 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): D package | 73°C/W                     |
| (see Note 2): DB package   | 82°C/W                     |
| (see Note 2): DGV package  | 120°C/W                    |
| (see Note 2): N package  | 67°C/W                     |
| (see Note 2): NS package   | 64°C/W                     |
| (see Note 2): PW package   | 108°C/W                    |
| (see Note 3): RGY package  | 39°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.  
3. The package thermal impedance is calculated in accordance with JESD 51-5.

### recommended operating conditions (see Note 4)

|                 |                                    |                                 | SN54AHC138 |                 | SN74AHC138 |                 | 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                      |                                 | 0          | 5.5             | 0          | 5.5             | V    |
| V <sub>O</sub>  | Output voltage                     |                                 | 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 4: All unused inputs of the device must be held at  $V_{CC}$  or GND to ensure proper device operation. Refer to the TI application report, *Implications of Slow or Floating CMOS Inputs*, literature number SCBA004.



# SN54AHC138, SN74AHC138

## 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

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**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 |     |      | SN54AHC138 |     | SN74AHC138 |      | 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       |      |      |
|                 | I <sub>OH</sub> = -8 mA                                     | 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 |      |
|                 | I <sub>OL</sub> = 8 mA                                      | 4.5 V           |                       |     | 0.36 |            | 0.5 |            | 0.44 |      |
| I <sub>I</sub>  | V <sub>I</sub> = 5.5 V or GND                               | 0 V to 5.5 V    |                       |     | ±0.1 |            | ±1* |            | ±1   | 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>  | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 5 V             |                       | 2   | 10   |            |     |            | 10   | pF   |

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

**switching characteristics over recommended operating free-air temperature range, V<sub>CC</sub> = 3.3 V ± 0.3 V (unless otherwise noted) (see Figure 1)**

| PARAMETER        | FROM (INPUT) | TO (OUTPUT) | LOAD CAPACITANCE       | T <sub>A</sub> = 25°C |       |        | SN54AHC138 |        | SN74AHC138 |      | UNIT |
|------------------|--------------|-------------|------------------------|-----------------------|-------|--------|------------|--------|------------|------|------|
|                  |              |             |                        | MIN                   | TYP   | MAX    | MIN        | MAX    | MIN        | MAX  |      |
| t <sub>PLH</sub> | A, B, C      | Any Y       | C <sub>L</sub> = 15 pF |                       | 8.2** | 11.4** | 1**        | 13**   | 1          | 13   | ns   |
| t <sub>PHL</sub> |              |             |                        |                       | 8.2** | 11.4** | 1**        | 13**   | 1          | 13   |      |
| t <sub>PLH</sub> | G1           | Any Y       | C <sub>L</sub> = 15 pF |                       | 8.1** | 12.8** | 1**        | 15**   | 1          | 15   | ns   |
| t <sub>PHL</sub> |              |             |                        |                       | 8.1** | 12.8** | 1**        | 15**   | 1          | 15   |      |
| t <sub>PLH</sub> | G̅2A, G̅2B   | Any Y       | C <sub>L</sub> = 15 pF |                       | 8.2** | 11.4** | 1**        | 13.5** | 1          | 13.5 | ns   |
| t <sub>PHL</sub> |              |             |                        |                       | 8.2** | 11.4** | 1**        | 13.5** | 1          | 13.5 |      |
| t <sub>PLH</sub> | A, B, C      | Any Y       | C <sub>L</sub> = 50 pF |                       | 10    | 15.8   | 1          | 18     | 1          | 18   | ns   |
| t <sub>PHL</sub> |              |             |                        |                       | 10    | 15.8   | 1          | 18     | 1          | 18   |      |
| t <sub>PLH</sub> | G1           | Any Y       | C <sub>L</sub> = 50 pF |                       | 10.6  | 16.3   | 1          | 18.5   | 1          | 18.5 | ns   |
| t <sub>PHL</sub> |              |             |                        |                       | 10.6  | 16.3   | 1          | 18.5   | 1          | 18.5 |      |
| t <sub>PLH</sub> | G̅2A, G̅2B   | Any Y       | C <sub>L</sub> = 50 pF |                       | 10.7  | 14.9   | 1          | 17     | 1          | 17   | ns   |
| t <sub>PHL</sub> |              |             |                        |                       | 10.7  | 14.9   | 1          | 17     | 1          | 17   |      |

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



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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 |      |     | SN54AHC138 |     | SN74AHC138 |     | UNIT |
|------------------|-----------------|----------------|------------------------|-----------------------|------|-----|------------|-----|------------|-----|------|
|                  |                 |                |                        | MIN                   | TYP  | MAX | MIN        | MAX | MIN        | MAX |      |
| t <sub>PLH</sub> | A, B, C         | Any Y          | C <sub>L</sub> = 15 pF | 5.7*                  | 8.1* | 1*  | 9.5*       | 1   | 9.5        | ns  |      |
| t <sub>PHL</sub> |                 |                |                        | 5.7*                  | 8.1* | 1*  | 9.5*       | 1   | 9.5        |     |      |
| t <sub>PLH</sub> | G1              | Any Y          | C <sub>L</sub> = 15 pF | 5.6*                  | 8.1* | 1*  | 9.5*       | 1   | 9.5        | ns  |      |
| t <sub>PHL</sub> |                 |                |                        | 5.6*                  | 8.1* | 1*  | 9.5*       | 1   | 9.5        |     |      |
| t <sub>PLH</sub> | G̅2A, G̅2B      | Any Y          | C <sub>L</sub> = 15 pF | 5.8*                  | 8.1* | 1*  | 9.5*       | 1   | 9.5        | ns  |      |
| t <sub>PHL</sub> |                 |                |                        | 5.8*                  | 8.1* | 1*  | 9.5*       | 1   | 9.5        |     |      |
| t <sub>PLH</sub> | A, B, C         | Any Y          | C <sub>L</sub> = 50 pF | 7.2                   | 10.1 | 1   | 11.5       | 1   | 11.5       | ns  |      |
| t <sub>PHL</sub> |                 |                |                        | 7.2                   | 10.1 | 1   | 11.5       | 1   | 11.5       |     |      |
| t <sub>PLH</sub> | G1              | Any Y          | C <sub>L</sub> = 50 pF | 7.1                   | 10.1 | 1   | 11.5       | 1   | 11.5       | ns  |      |
| t <sub>PHL</sub> |                 |                |                        | 7.1                   | 10.1 | 1   | 11.5       | 1   | 11.5       |     |      |
| t <sub>PLH</sub> | G̅2A, G̅2B      | Any Y          | C <sub>L</sub> = 50 pF | 7.3                   | 10.1 | 1   | 11.5       | 1   | 11.5       | ns  |      |
| t <sub>PHL</sub> |                 |                |                        | 7.3                   | 10.1 | 1   | 11.5       | 1   | 11.5       |     |      |

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

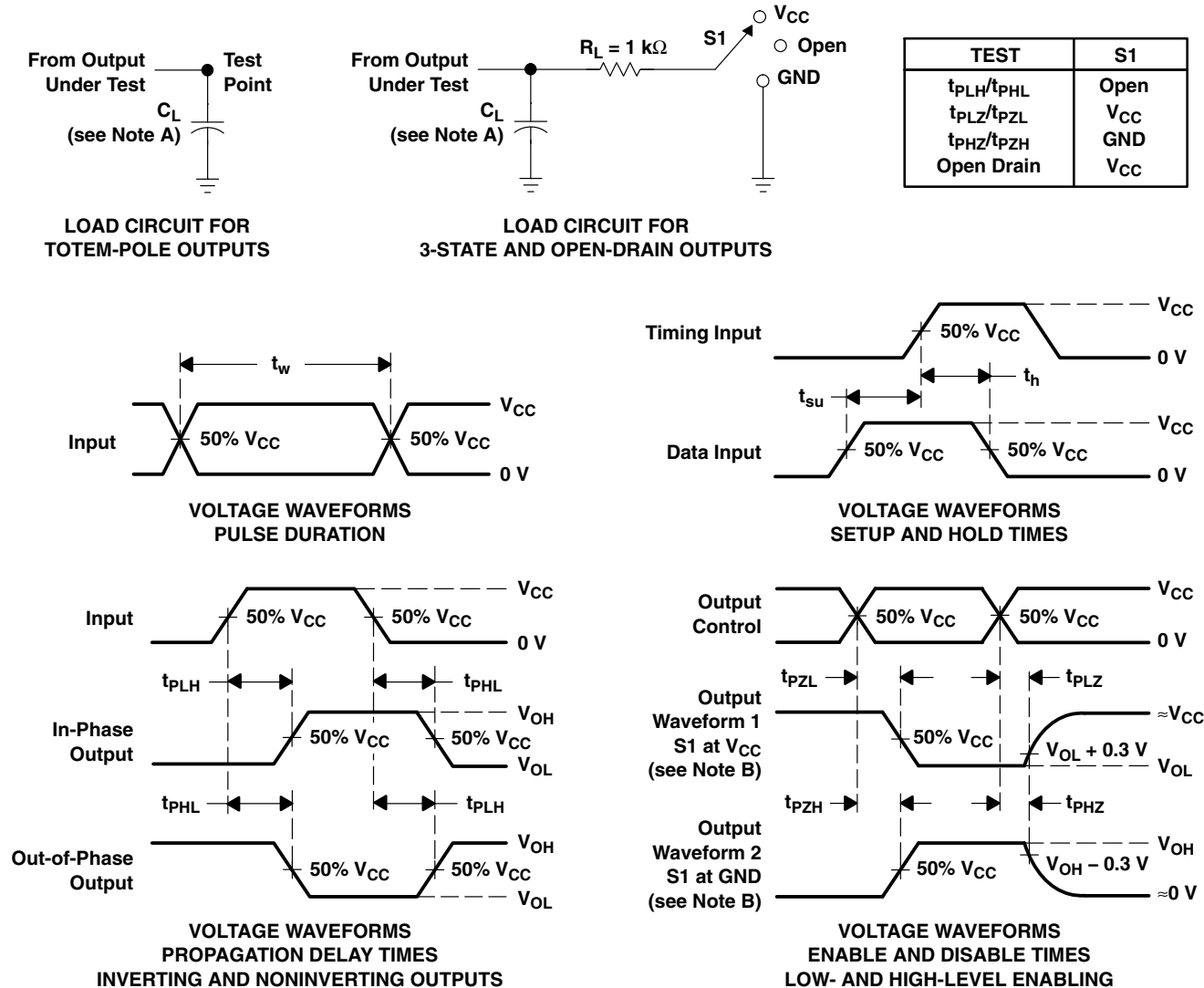
operating characteristics,  $V_{CC} = 5\text{ V}$ ,  $T_A = 25^\circ\text{C}$

| PARAMETER                              | TEST CONDITIONS             | TYP | UNIT |
|--|-----------------------------|-----|------|
| $C_{pd}$ Power dissipation capacitance | No load, $f = 1\text{ MHz}$ | 13  | pF   |

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## PARAMETER MEASUREMENT INFORMATION



- 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:  $PRR \leq 1 \text{ MHz}$ ,  $Z_O = 50 \Omega$ ,  $t_r \leq 3 \text{ ns}$ ,  $t_f \leq 3 \text{ ns}$ .  
 D. The outputs are measured one at a time with one input transition per measurement.  
 E. All parameters and waveforms are not applicable to all devices.

**Figure 1. Load Circuit and Voltage Waveforms**

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## APPLICATION INFORMATION

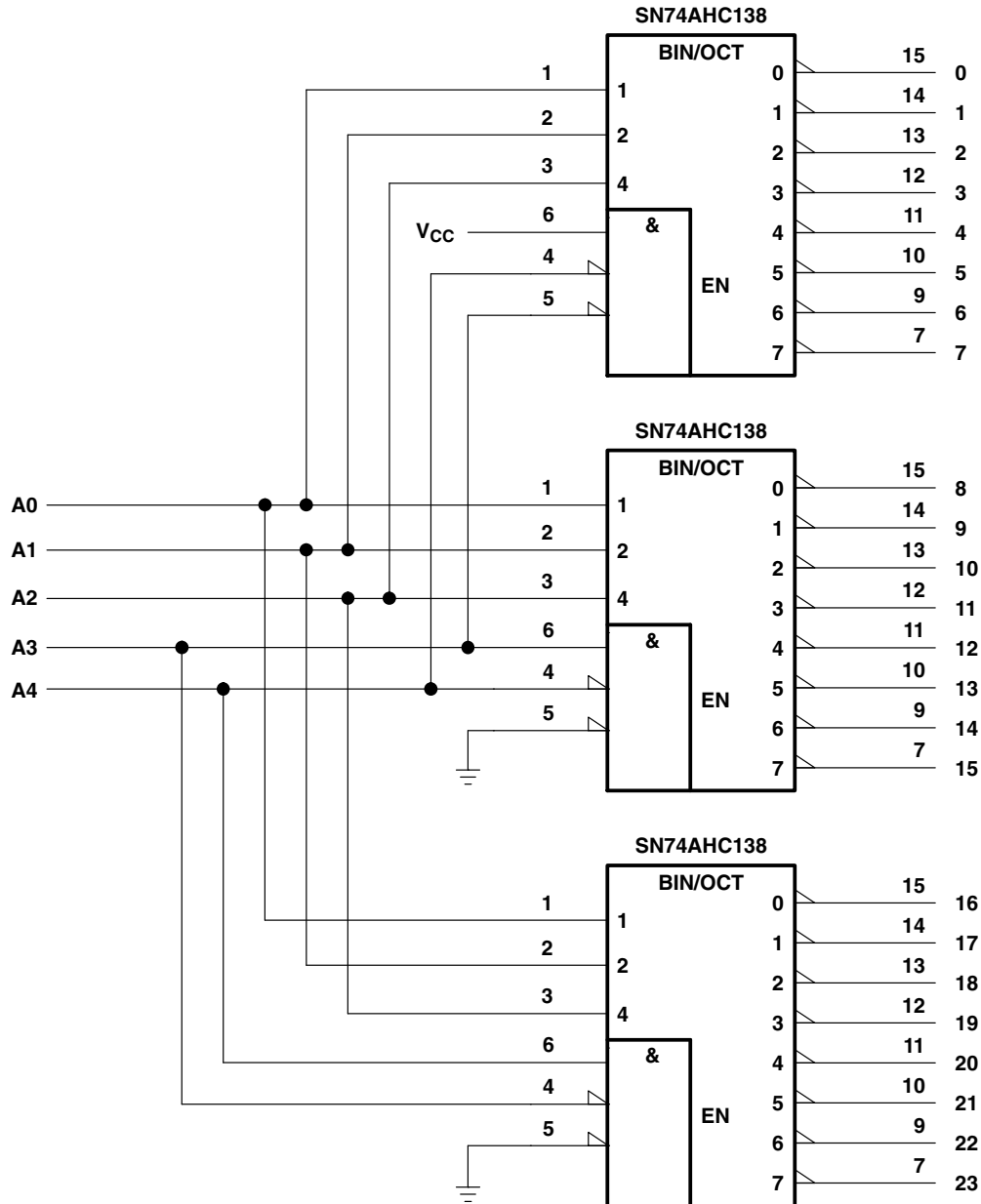


Figure 2. 24-Bit Decoding Scheme

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## APPLICATION INFORMATION

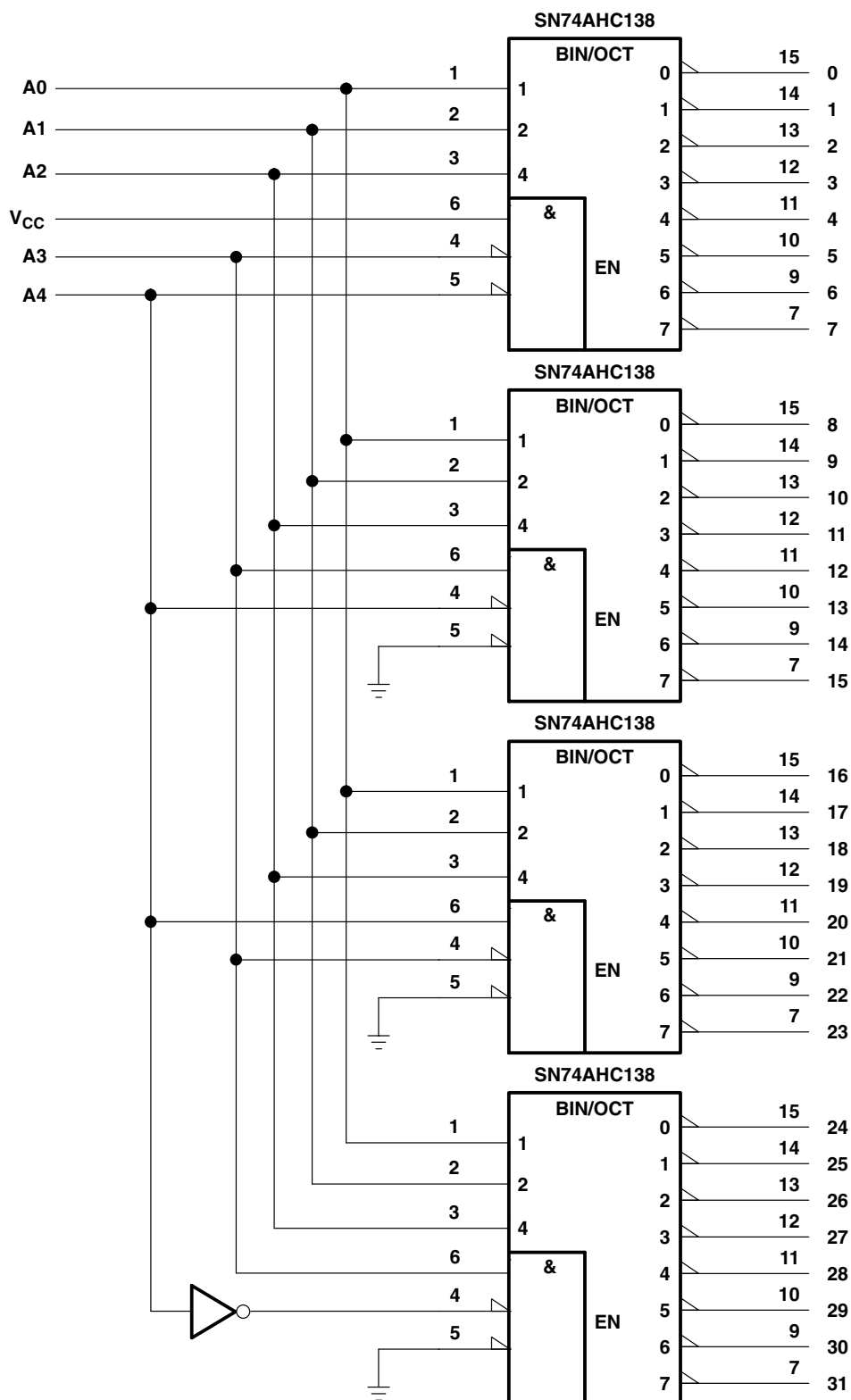


Figure 3. 32-Bit Decoding Scheme



**PACKAGING INFORMATION**

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)                  | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|------------------|----------------------|--------------|--|-------------------------|
| 5962-9851601Q2A  | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | 5962-<br>9851601Q2A<br>SNJ54AHC<br>138FK | <a href="#">Samples</a> |
| 5962-9851601QEA  | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 5962-9851601QE<br>A<br>SNJ54AHC138J      | <a href="#">Samples</a> |
| 5962-9851601QFA  | ACTIVE        | CFP          | W                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 5962-9851601QF<br>A<br>SNJ54AHC138W      | <a href="#">Samples</a> |
| SN74AHC138D      | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AHC138                                   | <a href="#">Samples</a> |
| SN74AHC138DBLE   | OBSOLETE      | SSOP         | DB                 | 16   |                | TBD                        | Call TI          | Call TI              | -40 to 85    |  |                         |
| SN74AHC138DBR    | ACTIVE        | SSOP         | DB                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138DBRE4  | ACTIVE        | SSOP         | DB                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138DBRG4  | ACTIVE        | SSOP         | DB                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138DE4    | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AHC138                                   | <a href="#">Samples</a> |
| SN74AHC138DG4    | ACTIVE        | SOIC         | D                  | 16   | 40             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AHC138                                   | <a href="#">Samples</a> |
| SN74AHC138DGVR   | ACTIVE        | TVSOP        | DGV                | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138DGVRE4 | ACTIVE        | TVSOP        | DGV                | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138DGVRG4 | ACTIVE        | TVSOP        | DGV                | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138DR     | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AHC138                                   | <a href="#">Samples</a> |
| SN74AHC138DRE4   | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AHC138                                   | <a href="#">Samples</a> |
| SN74AHC138DRG4   | ACTIVE        | SOIC         | D                  | 16   | 2500           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AHC138                                   | <a href="#">Samples</a> |

| Orderable Device | Status<br>(1) | Package Type | Package<br>Drawing | Pins | Package<br>Qty | Eco Plan<br>(2)            | Lead/Ball Finish | MSL Peak Temp<br>(3) | Op Temp (°C) | Device Marking<br>(4/5)                  | Samples                 |
|------------------|---------------|--------------|--------------------|------|----------------|----------------------------|------------------|----------------------|--------------|--|-------------------------|
| SN74AHC138N      | ACTIVE        | PDIP         | N                  | 16   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | -40 to 85    | SN74AHC138N                              | <a href="#">Samples</a> |
| SN74AHC138NE4    | ACTIVE        | PDIP         | N                  | 16   | 25             | Pb-Free<br>(RoHS)          | CU NIPDAU        | N / A for Pkg Type   | -40 to 85    | SN74AHC138N                              | <a href="#">Samples</a> |
| SN74AHC138NSR    | ACTIVE        | SO           | NS                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AHC138                                   | <a href="#">Samples</a> |
| SN74AHC138NSRE4  | ACTIVE        | SO           | NS                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AHC138                                   | <a href="#">Samples</a> |
| SN74AHC138NSRG4  | ACTIVE        | SO           | NS                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | AHC138                                   | <a href="#">Samples</a> |
| SN74AHC138PW     | ACTIVE        | TSSOP        | PW                 | 16   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138PWE4   | ACTIVE        | TSSOP        | PW                 | 16   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138PWG4   | ACTIVE        | TSSOP        | PW                 | 16   | 90             | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138PWLE   | OBSOLETE      | TSSOP        | PW                 | 16   |                | TBD                        | Call TI          | Call TI              | -40 to 85    |  |                         |
| SN74AHC138PWR    | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138PWRE4  | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138PWRG4  | ACTIVE        | TSSOP        | PW                 | 16   | 2000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM   | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138RGYR   | ACTIVE        | VQFN         | RGY                | 16   | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR  | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SN74AHC138RGYRG4 | ACTIVE        | VQFN         | RGY                | 16   | 3000           | Green (RoHS<br>& no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR  | -40 to 85    | HA138                                    | <a href="#">Samples</a> |
| SNJ54AHC138FK    | ACTIVE        | LCCC         | FK                 | 20   | 1              | TBD                        | POST-PLATE       | N / A for Pkg Type   | -55 to 125   | 5962-<br>9851601Q2A<br>SNJ54AHC<br>138FK | <a href="#">Samples</a> |
| SNJ54AHC138J     | ACTIVE        | CDIP         | J                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 5962-9851601QE<br>A<br>SNJ54AHC138J      | <a href="#">Samples</a> |
| SNJ54AHC138W     | ACTIVE        | CFP          | W                  | 16   | 1              | TBD                        | A42              | N / A for Pkg Type   | -55 to 125   | 5962-9851601QF<br>A<br>SNJ54AHC138W      | <a href="#">Samples</a> |

(1) 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.

(2) Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), 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.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**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)

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

(4) There may be additional marking, which relates to the logo, the lot trace code information, or the environmental category on the device.

(5) Multiple Device Markings will be inside parentheses. Only one Device Marking contained in parentheses and separated by a "~" will appear on a device. If a line is indented then it is a continuation of the previous line and the two combined represent the entire Device Marking for that device.

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#### **OTHER QUALIFIED VERSIONS OF SN54AHC138, SN74AHC138 :**

● Catalog: [SN74AHC138](#)

● Military: [SN54AHC138](#)

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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74AHC138DBR  | SSOP         | DB              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 6.6     | 2.5     | 12.0    | 16.0   | Q1            |
| SN74AHC138DGVR | TVSOP        | DGV             | 16   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74AHC138DR   | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74AHC138PWR  | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 6.9     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74AHC138RGYR | VQFN         | RGY             | 16   | 3000 | 330.0              | 12.4               | 3.8     | 4.3     | 1.5     | 8.0     | 12.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74AHC138DBR  | SSOP         | DB              | 16   | 2000 | 367.0       | 367.0      | 38.0        |
| SN74AHC138DGVR | TVSOP        | DGV             | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74AHC138DR   | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |
| SN74AHC138PWR  | TSSOP        | PW              | 16   | 2000 | 367.0       | 367.0      | 35.0        |
| SN74AHC138RGYR | VQFN         | RGY             | 16   | 3000 | 367.0       | 367.0      | 35.0        |

J (R-GDIP-T\*\*)

14 LEADS SHOWN

# CERAMIC DUAL IN-LINE PACKAGE



| PINS **<br>DIM | 14                     | 16                     | 18                     | 20                     |
|----------------|------------------------|------------------------|------------------------|------------------------|
| A              | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC | 0.300<br>(7,62)<br>BSC |
| B MAX          | 0.785<br>(19,94)       | .840<br>(21,34)        | 0.960<br>(24,38)       | 1.060<br>(26,92)       |
| B MIN          | —                      | —                      | —                      | —                      |
| C MAX          | 0.300<br>(7,62)        | 0.300<br>(7,62)        | 0.310<br>(7,87)        | 0.300<br>(7,62)        |
| C MIN          | 0.245<br>(6,22)        | 0.245<br>(6,22)        | 0.220<br>(5,59)        | 0.245<br>(6,22)        |

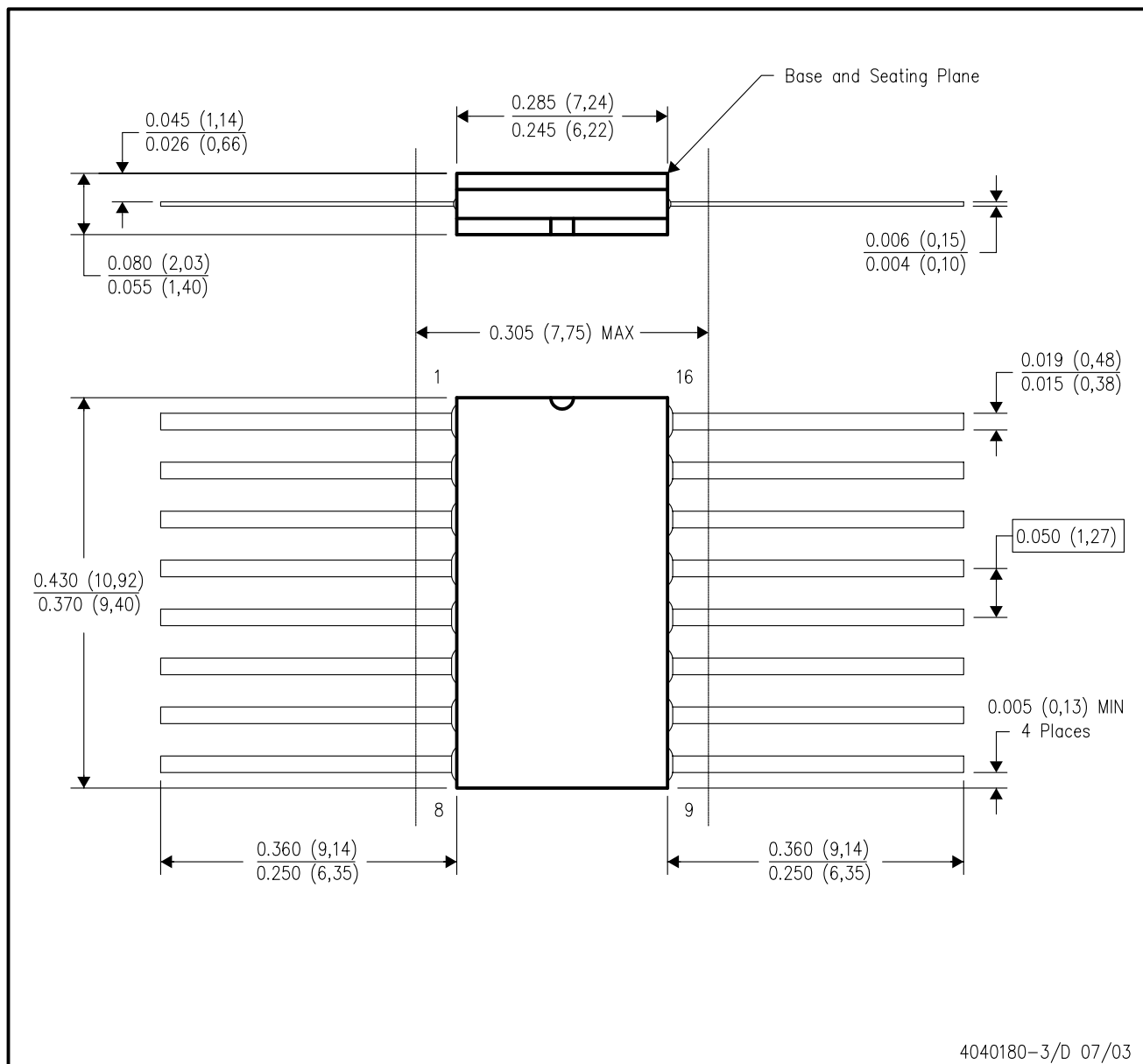


4040083/F 03/03

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - C. This package is hermetically sealed with a ceramic lid using glass frit.
  - D. Index point is provided on cap for terminal identification only on press ceramic glass frit seal only.
  - E. Falls within MIL STD 1835 GDIP1-T14, GDIP1-T16, GDIP1-T18 and GDIP1-T20.

W (R-GDFP-F16)

CERAMIC DUAL FLATPACK



- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a ceramic lid using glass frit.
  - Index point is provided on cap for terminal identification only.
  - Falls within MIL STD 1835 GDFP1-F16 and JEDEC MO-092AC



FK (S-CQCC-N\*\*)

LEADLESS CERAMIC CHIP CARRIER

28 TERMINAL SHOWN



| NO. OF<br>TERMINALS<br>** | A                |                  | B                |                  |
|---------------------------|------------------|------------------|------------------|------------------|
|                           | MIN              | MAX              | MIN              | MAX              |
| 20                        | 0.342<br>(8,69)  | 0.358<br>(9,09)  | 0.307<br>(7,80)  | 0.358<br>(9,09)  |
| 28                        | 0.442<br>(11,23) | 0.458<br>(11,63) | 0.406<br>(10,31) | 0.458<br>(11,63) |
| 44                        | 0.640<br>(16,26) | 0.660<br>(16,76) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 52                        | 0.740<br>(18,78) | 0.761<br>(19,32) | 0.495<br>(12,58) | 0.560<br>(14,22) |
| 68                        | 0.938<br>(23,83) | 0.962<br>(24,43) | 0.850<br>(21,6)  | 0.858<br>(21,8)  |
| 84                        | 1.141<br>(28,99) | 1.165<br>(29,59) | 1.047<br>(26,6)  | 1.063<br>(27,0)  |



4040140/D 01/11

- NOTES:
- All linear dimensions are in inches (millimeters).
  - This drawing is subject to change without notice.
  - This package can be hermetically sealed with a metal lid.
  - Falls within JEDEC MS-004

## N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **             | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| DIM                 |                  |                  |                  |                  |
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



4040049/E 12/2002

- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).
  - The 20 pin end lead shoulder width is a vendor option, either half or full width.

## DGV (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

24 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.  
 D. Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194

D (R-PDSO-G16)

PLASTIC SMALL OUTLINE



- NOTES:
- A. All linear dimensions are in inches (millimeters).
  - B. This drawing is subject to change without notice.
  - $\triangle C$  Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0.006 (0,15) each side.
  - $\triangle D$  Body width does not include interlead flash. Interlead flash shall not exceed 0.017 (0,43) each side.
  - E. Reference JEDEC MS-012 variation AC.

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE



4040064-4/G 02/11

- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. Body length does not include mold flash, protrusions, or gate burrs. Mold flash, protrusions, or gate burrs shall not exceed 0,15 each side.
  - D. Body width does not include interlead flash. Interlead flash shall not exceed 0,25 each side.
  - E. Falls within JEDEC MO-153

PW (R-PDSO-G16)

PLASTIC SMALL OUTLINE

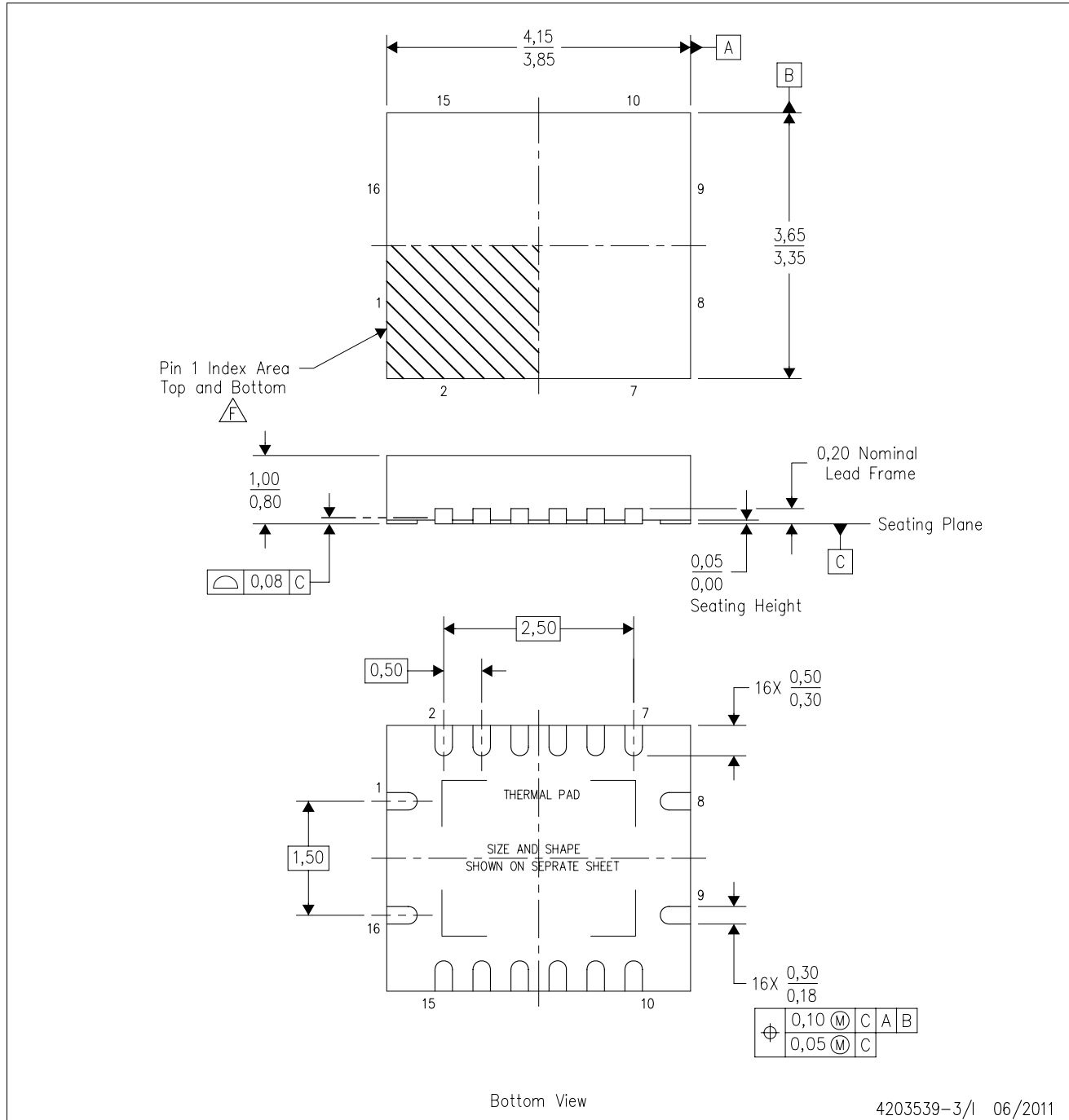


4211284-3/F 12/12

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Publication IPC-7351 is recommended for alternate designs.
  - D. Laser cutting apertures with trapezoidal walls and also rounding corners will offer better paste release. Customers should contact their board assembly site for stencil design recommendations. Refer to IPC-7525 for other stencil recommendations.
  - E. Customers should contact their board fabrication site for solder mask tolerances between and around signal pads.

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



4203539-3/I 06/2011

- NOTES:
- All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - This drawing is subject to change without notice.
  - QFN (Quad Flatpack No-Lead) package configuration.
  - The package thermal pad must be soldered to the board for thermal and mechanical performance.
  - See the additional figure in the Product Data Sheet for details regarding the exposed thermal pad features and dimensions.
- F** Pin 1 identifiers are located on both top and bottom of the package and within the zone indicated. The Pin 1 identifiers are either a molded, marked, or metal feature.
- Package complies to JEDEC MO-241 variation BA.

RGY (R-PVQFN-N16)

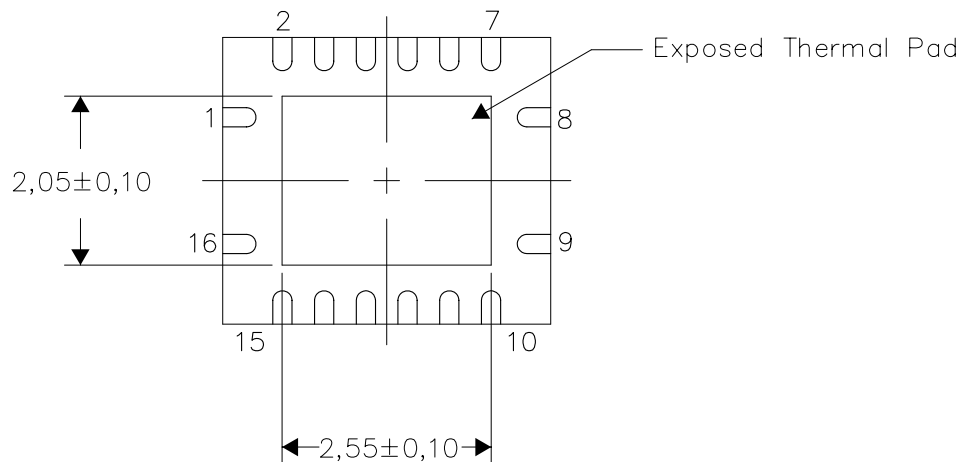
PLASTIC QUAD FLATPACK NO-LEAD

## THERMAL INFORMATION

This package incorporates an exposed thermal pad that is designed to be attached directly to an external heatsink. The thermal pad must be soldered directly to the printed circuit board (PCB). After soldering, the PCB can be used as a heatsink. In addition, through the use of thermal vias, the thermal pad can be attached directly to the appropriate copper plane shown in the electrical schematic for the device, or alternatively, can be attached to a special heatsink structure designed into the PCB. This design optimizes the heat transfer from the integrated circuit (IC).

For information on the Quad Flatpack No-Lead (QFN) package and its advantages, refer to Application Report, QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271. This document is available at [www.ti.com](http://www.ti.com).

The exposed thermal pad dimensions for this package are shown in the following illustration.



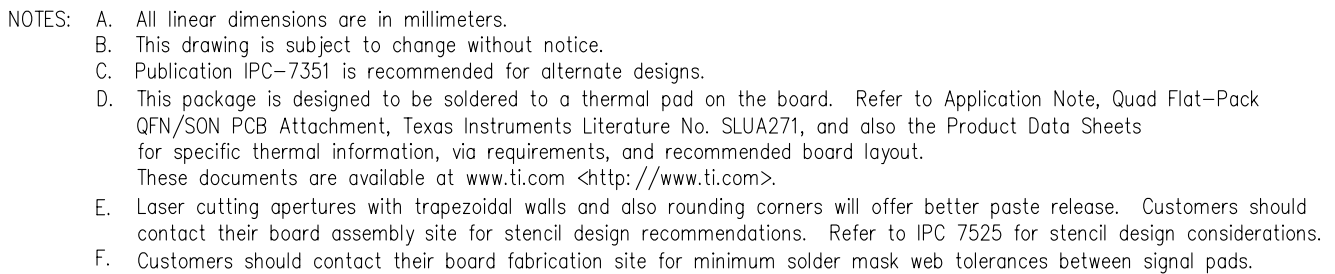
Bottom View

Exposed Thermal Pad Dimensions

4206353-3/0 11/11

NOTE: All linear dimensions are in millimeters





# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

## DB (R-PDSO-G\*\*)

## PLASTIC SMALL-OUTLINE

28 PINS SHOWN



- NOTES: A. All linear dimensions are in millimeters.  
 B. This drawing is subject to change without notice.  
 C. Body dimensions do not include mold flash or protrusion not to exceed 0,15.  
 D. Falls within JEDEC MO-150

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|                              |  |
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| Clocks and Timers            | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>                             |
| Interface                    | <a href="http://interface.ti.com">interface.ti.com</a>                               |
| Logic                        | <a href="http://logic.ti.com">logic.ti.com</a>                                       |
| Power Mgmt                   | <a href="http://power.ti.com">power.ti.com</a>                                       |
| Microcontrollers             | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a>                   |
| RFID                         | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>                                 |
| OMAP Applications Processors | <a href="http://www.ti.com/omap">www.ti.com/omap</a>                                 |
| Wireless Connectivity        | <a href="http://www.ti.com/wirelessconnectivity">www.ti.com/wirelessconnectivity</a> |

### Applications

|                               |  |
|-------------------------------|--|
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| Communications and Telecom    | <a href="http://www.ti.com/communications">www.ti.com/communications</a>                 |
| Computers and Peripherals     | <a href="http://www.ti.com/computers">www.ti.com/computers</a>                           |
| Consumer Electronics          | <a href="http://www.ti.com/consumer-apps">www.ti.com/consumer-apps</a>                   |
| Energy and Lighting           | <a href="http://www.ti.com/energy">www.ti.com/energy</a>                                 |
| Industrial                    | <a href="http://www.ti.com/industrial">www.ti.com/industrial</a>                         |
| Medical                       | <a href="http://www.ti.com/medical">www.ti.com/medical</a>                               |
| Security                      | <a href="http://www.ti.com/security">www.ti.com/security</a>                             |
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