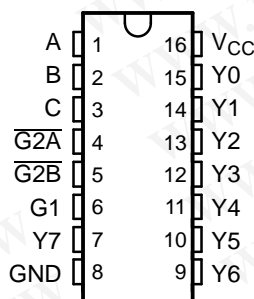


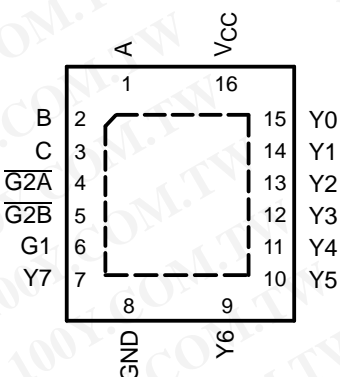
## FEATURES

- **2-V to 5.5-V  $V_{CC}$  Operation**
- **Max  $t_{pd}$  of 9.5 ns at 5 V**
- **Typical  $V_{OLP}$  (Output Ground Bounce)  $<0.8$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$**
- **Typical  $V_{OHV}$  (Output  $V_{OH}$  Undershoot)  $>2.3$  V at  $V_{CC} = 3.3$  V,  $T_A = 25^\circ\text{C}$**
- **Support Mixed-Mode Voltage Operation on All Ports**
- **$I_{off}$  Supports Partial-Power-Down Mode Operation**
- **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)

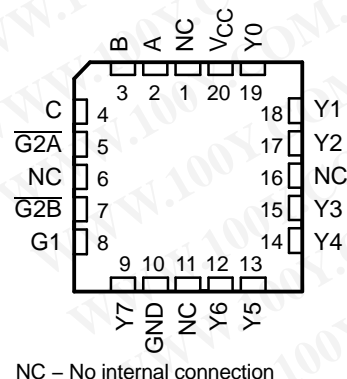
**SN54LV138A ... J OR W PACKAGE**  
**SN74LV138A ... D, DB, DGV, NS**  
**OR PW PACKAGE**  
**(TOP VIEW)**



**SN74LV138A ... RGY PACKAGE**  
**(TOP VIEW)**



**SN54LV138A ... FK PACKAGE**  
**(TOP VIEW)**



## DESCRIPTION/ORDERING INFORMATION

The 'LV138A devices are 3-line to 8-line decoders/demultiplexers designed for 2-V to 5.5-V  $V_{CC}$  operation.

### ORDERING INFORMATION

| $T_A$          | PACKAGE <sup>(1)</sup> |              | ORDERABLE PART NUMBER | TOP-SIDE MARKING |
|----------------|------------------------|--------------|-----------------------|------------------|
| –40°C to 85°C  | QFN – RGY              | Reel of 1000 | SN74LV138ARGYR        | LV138A           |
|                | SOIC – D               | Tube of 40   | SN74LV138AD           | LV138A           |
|                |                        | Reel of 2500 | SN74LV138ADR          |                  |
|                | SOP – NS               | Reel of 2000 | SN74LV138ANSR         | 74LV138A         |
|                | SSOP – DB              | Reel of 2000 | SN74LV138ADBR         | LV138A           |
|                | TSSOP – PW             | Tube of 90   | SN74LV138APW          | LV138A           |
|                |                        | Reel of 2000 | SN74LV138APWR         |                  |
|                |                        | Reel of 250  | SN74LV138APWT         |                  |
|                | TVSOP – DGV            | Reel of 2000 | SN74LV138ADGVR        | LV138A           |
| –55°C to 125°C | CDIP – J               | Tube of 25   | SNJ54LV138AJ          | SNJ54LV138AJ     |
|                | CFP – W                | Tube of 150  | SNJ54LV138AW          | SNJ54LV138AW     |
|                | LCCC – FK              | Tube of 55   | SNJ54LV138AFK         | SNJ54LV138AFK    |

(1) 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.

# SN54LV138A, SN74LV138A

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

SCLS395L–APRIL 1998–REVISED AUGUST 2005

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-34970699  
勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)



### DESCRIPTION/ORDERING INFORMATION (CONTINUED)

These devices are designed for high-performance memory-decoding or data-routing applications requiring 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 decoder is negligible.

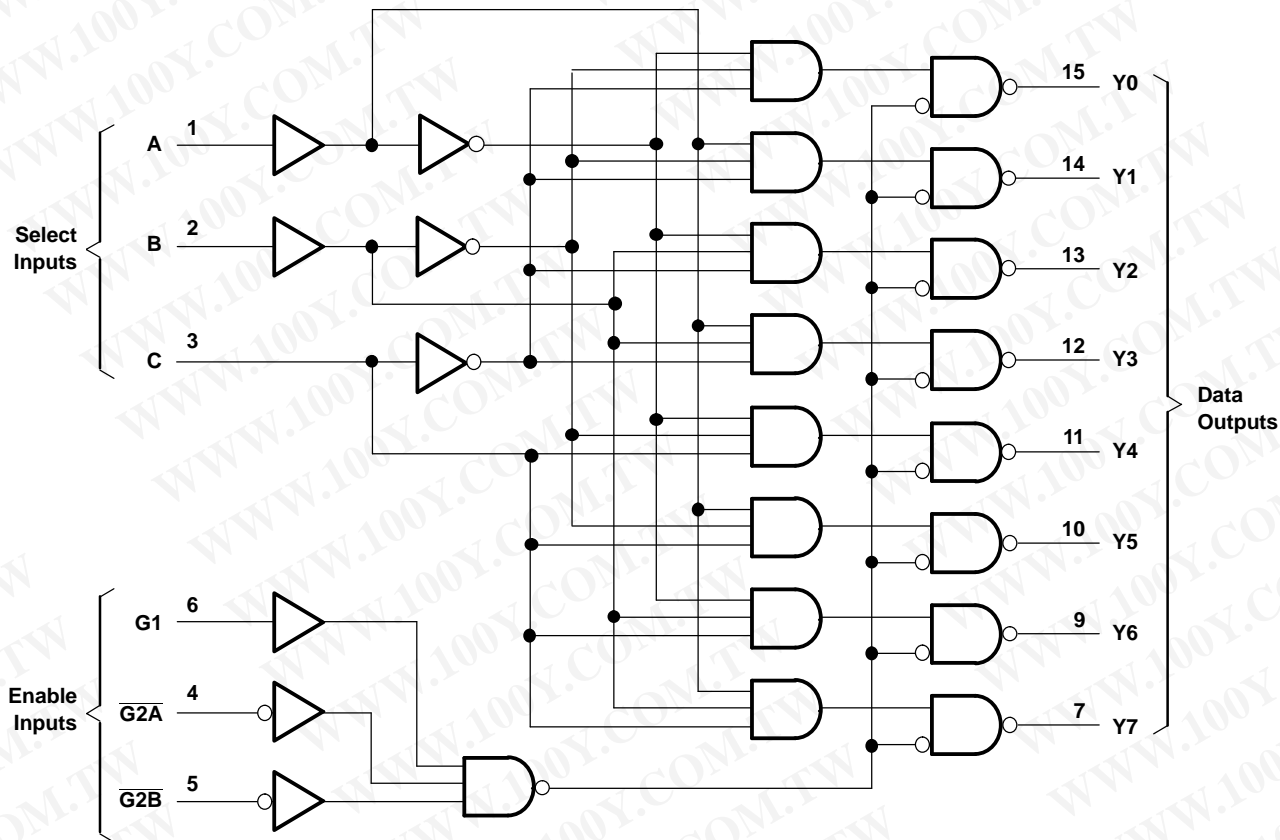
The conditions at the binary-select inputs (A, B, C) and the three enable inputs (G1,  $\overline{G2A}$ ,  $\overline{G2B}$ ) select one of eight output lines. The two active-low ( $\overline{G2A}$ ,  $\overline{G2B}$ ) and one active-high (G1) enable inputs reduce the need for external gates or inverters 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.

These devices are fully specified for partial-power-down applications using  $I_{off}$ . The  $I_{off}$  circuitry disables the outputs, preventing damaging current backflow through the devices when they are powered down.

FUNCTION TABLE

| ENABLE INPUTS |                  |                  | SELECT INPUTS |   |   | OUTPUTS |    |     |    |    |    |    |    |
|---------------|------------------|------------------|---------------|---|---|---------|----|-----|----|----|----|----|----|
| G1            | $\overline{G2A}$ | $\overline{G2B}$ | C             | B | A | Y0      | Y1 | Y20 | 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, NS, PW, RGY, and W packages.

# SN54LV138A, SN74LV138A 3-LINE TO 8-LINE DECODERS/DEMULTIPLEXERS

SCLS395L–APRIL 1998–REVISED AUGUST 2005

勝特力材料 886-3-5753170  
勝特力电子(上海) 86-21-34970699  
勝特力电子(深圳) 86-755-83298787  
Http://www.100y.com.tw



## Absolute Maximum Ratings<sup>(1)</sup>

over operating free-air temperature range (unless otherwise noted)

|               |   | MIN                        | MAX            | UNIT |
|---------------|---|----------------------------|----------------|------|
| $V_{CC}$      | Supply voltage range  | –0.5                       | 7              | V    |
| $V_I$         | Input voltage range <sup>(2)</sup>  | –0.5                       | 7              | V    |
| $V_O$         | Voltage range applied to any output in the high-impedance or power-off state <sup>(2)</sup> | –0.5                       | 7              | V    |
| $V_O$         | Output voltage range <sup>(2)(3)</sup>  | –0.5                       | $V_{CC} + 0.5$ | V    |
| $I_{IK}$      | Input clamp current   | $V_I < 0$                  | –20            | mA   |
| $I_{OK}$      | Output clamp current  | $V_O < 0$                  | –50            | mA   |
| $I_O$         | Continuous output current   | $V_O = 0$ to $V_{CC}$      | ±25            | mA   |
|               | Continuous current through $V_{CC}$ or GND  |                            | ±50            | mA   |
| $\theta_{JA}$ | Package thermal impedance   | D package <sup>(4)</sup>   | 73             | °C/W |
|               |   | DB package <sup>(4)</sup>  | 82             |      |
|               |   | DGV package <sup>(4)</sup> | 120            |      |
|               |   | NS package <sup>(4)</sup>  | 64             |      |
|               |   | PW package <sup>(4)</sup>  | 108            |      |
|               |   | RGY package <sup>(5)</sup> | 39             |      |
| $T_{stg}$     | Storage temperature range   | –65                        | 150            | °C   |

- (1) 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.
- (2) The input and output negative-voltage ratings may be exceeded if the input and output current ratings are observed.
- (3) This value is limited to 5.5 V maximum.
- (4) The package thermal impedance is calculated in accordance with JESD 51-7
- (5) The package thermal impedance is calculated in accordance with JESD 51-5.



## Recommended Operating Conditions<sup>(1)</sup>

|                 |                                    |                                  | SN54LV138A <sup>(2)</sup> |                 | SN74LV138A            |                 | 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> = 2.3 V to 2.7 V | V <sub>CC</sub> × 0.7     |                 | V <sub>CC</sub> × 0.7 |                 |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | V <sub>CC</sub> × 0.7     |                 | V <sub>CC</sub> × 0.7 |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | V <sub>CC</sub> × 0.7     |                 | V <sub>CC</sub> × 0.7 |                 |      |
| V <sub>IL</sub> | Low-level input voltage            | V <sub>CC</sub> = 2 V            | 0.5                       |                 | 0.5                   |                 | V    |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | V <sub>CC</sub> × 0.3     |                 | V <sub>CC</sub> × 0.3 |                 |      |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | V <sub>CC</sub> × 0.3     |                 | V <sub>CC</sub> × 0.3 |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | V <sub>CC</sub> × 0.3     |                 | V <sub>CC</sub> × 0.3 |                 |      |
| 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> = 2.3 V to 2.7 V | −2                        |                 | −2                    |                 | mA   |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | −6                        |                 | −6                    |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | −12                       |                 | −12                   |                 |      |
| I <sub>OL</sub> | Low-level output current           | V <sub>CC</sub> = 2 V            | 50                        |                 | 50                    |                 | μA   |
|                 |                                    | V <sub>CC</sub> = 2.3 V to 2.7 V | 2                         |                 | 2                     |                 | mA   |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | 6                         |                 | 6                     |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | 12                        |                 | 12                    |                 |      |
| Δt/Δv           | Input transition rise or fall rate | V <sub>CC</sub> = 2.3 V to 2.7 V | 200                       |                 | 200                   |                 | ns/V |
|                 |                                    | V <sub>CC</sub> = 3 V to 3.6 V   | 100                       |                 | 100                   |                 |      |
|                 |                                    | V <sub>CC</sub> = 4.5 V to 5.5 V | 20                        |                 | 20                    |                 |      |
| T <sub>A</sub>  | Operating free-air temperature     |                                  | −55                       | 125             | −40                   | 85              | °C   |

(1) 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.

(2) Product Preview

## Electrical Characteristics

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

| PARAMETER        | TEST CONDITIONS   | V <sub>CC</sub> | SN54LV138A <sup>(1)</sup> |     |     | SN74LV138A            |     |     | UNIT |
|------------------|---|-----------------|---------------------------|-----|-----|-----------------------|-----|-----|------|
|                  |   |                 | MIN                       | TYP | MAX | MIN                   | TYP | MAX |      |
| V <sub>OH</sub>  | I <sub>OH</sub> = –50 μA                                    | 2 V to 5.5 V    | V <sub>CC</sub> – 0.1     |     |     | V <sub>CC</sub> – 0.1 |     |     | V    |
|                  | I <sub>OH</sub> = –2 mA                                     | 2.3 V           | 2                         |     |     | 2                     |     |     |      |
|                  | I <sub>OH</sub> = –6 mA                                     | 3 V             | 2.48                      |     |     | 2.48                  |     |     |      |
|                  | I <sub>OH</sub> = –12 mA                                    | 4.5 V           | 3.8                       |     |     | 3.8                   |     |     |      |
| V <sub>OL</sub>  | I <sub>OL</sub> = 50 μA                                     | 2 V to 5.5 V    | 0.1                       |     |     | 0.1                   |     |     | V    |
|                  | I <sub>OL</sub> = 2 mA                                      | 2.3 V           | 0.4                       |     |     | 0.4                   |     |     |      |
|                  | I <sub>OL</sub> = 6 mA                                      | 3 V             | 0.44                      |     |     | 0.44                  |     |     |      |
|                  | I <sub>OL</sub> = 12 mA                                     | 4.5 V           | 0.55                      |     |     | 0.55                  |     |     |      |
| I <sub>I</sub>   | V <sub>I</sub> = 5.5 V or GND                               | 0 to 5.5 V      | ±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           | 20                        |     |     | 20                    |     |     | μA   |
| I <sub>off</sub> | V <sub>I</sub> or V <sub>O</sub> = 0 to 5.5 V               | 0               | 5                         |     |     | 5                     |     |     | μA   |
| C <sub>i</sub>   | V <sub>I</sub> = V <sub>CC</sub> or GND                     | 3.3 V           | 2.1                       |     |     | 2.1                   |     |     | pF   |

(1) Product Preview

# SN54LV138A, SN74LV138A

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

SCLS395L–APRIL 1998–REVISED AUGUST 2005

### Switching Characteristics

over recommended operating free-air temperature range,  $V_{CC} = 2.5 \text{ V} \pm 0.2 \text{ V}$  (unless otherwise noted) (see Figure 1)

| PARAMETER | FROM (INPUT)                         | TO (OUTPUT) | LOAD CAPACITANCE      | $T_A = 25^\circ\text{C}$ |                     |     | SN54LV138A <sup>(1)</sup> |                   | SN74LV138A |     | UNIT |
|-----------|--------------------------------------|-------------|-----------------------|--------------------------|---------------------|-----|---------------------------|-------------------|------------|-----|------|
|           |                                      |             |                       | MIN                      | TYP                 | MAX | MIN                       | MAX               | MIN        | MAX |      |
| $t_{pd}$  | A, B, or C                           | Y           | $C_L = 15 \text{ pF}$ | 11.7 <sup>(2)</sup>      | 17.6 <sup>(2)</sup> |     | 1 <sup>(2)</sup>          | 21 <sup>(2)</sup> | 1          | 21  | ns   |
|           | G1                                   |             |                       | 12.3 <sup>(2)</sup>      | 19.2 <sup>(2)</sup> |     | 1 <sup>(2)</sup>          | 22 <sup>(2)</sup> | 1          | 22  |      |
|           | $\overline{G2A}$ or $\overline{G2B}$ |             |                       | 11.4 <sup>(2)</sup>      | 18.2 <sup>(2)</sup> |     | 1 <sup>(2)</sup>          | 21 <sup>(2)</sup> | 1          | 21  |      |
| $t_{pd}$  | A, B, or C                           | Y           | $C_L = 50 \text{ pF}$ | 14.9                     | 21.4                |     | 1                         | 25                | 1          | 25  | ns   |
|           | G1                                   |             |                       | 15.7                     | 22.6                |     | 1                         | 26                | 1          | 26  |      |
|           | G2A or G2B                           |             |                       | 14.8                     | 22                  |     | 1                         | 25                | 1          | 25  |      |

(1) Product Preview

(2) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### 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 (INPUT)                         | TO (OUTPUT) | LOAD CAPACITANCE      | $T_A = 25^\circ\text{C}$ |                     |     | SN54LV138A <sup>(1)</sup> |                     | SN74LV138A |      | UNIT |
|-----------|--------------------------------------|-------------|-----------------------|--------------------------|---------------------|-----|---------------------------|---------------------|------------|------|------|
|           |                                      |             |                       | MIN                      | TYP                 | MAX | MIN                       | MAX                 | MIN        | MAX  |      |
| $t_{pd}$  | A, B, or C                           | Y           | $C_L = 15 \text{ pF}$ | 8.1 <sup>(2)</sup>       | 11.4 <sup>(2)</sup> |     | 1 <sup>(2)</sup>          | 13.5 <sup>(2)</sup> | 1          | 13.5 | ns   |
|           | G1                                   |             |                       | 8.4 <sup>(2)</sup>       | 12.8 <sup>(2)</sup> |     | 1 <sup>(2)</sup>          | 15 <sup>(2)</sup>   | 1          | 15   |      |
|           | $\overline{G2A}$ or $\overline{G2B}$ |             |                       | 7.8 <sup>(2)</sup>       | 11.4 <sup>(2)</sup> |     | 1 <sup>(2)</sup>          | 13.5 <sup>(2)</sup> | 1          | 13.5 |      |
| $t_{pd}$  | A, B, or C                           | Y           | $C_L = 50 \text{ pF}$ | 10.3                     | 15.8                |     | 1                         | 18                  | 1          | 18   | ns   |
|           | G1                                   |             |                       | 10.6                     | 16.3                |     | 1                         | 18.5                | 1          | 18.5 |      |
|           | G2A or G2B                           |             |                       | 10                       | 14.9                |     | 1                         | 17                  | 1          | 17   |      |

(1) Product Preview

(2) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### 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 (INPUT)                         | TO (OUTPUT) | LOAD CAPACITANCE      | $T_A = 25^\circ\text{C}$ |                    |     | SN54LV138A <sup>(1)</sup> |                    | SN74LV138A |      | UNIT |
|-----------|--------------------------------------|-------------|-----------------------|--------------------------|--------------------|-----|---------------------------|--------------------|------------|------|------|
|           |                                      |             |                       | MIN                      | TYP                | MAX | MIN                       | MAX                | MIN        | MAX  |      |
| $t_{pd}$  | A, B, or C                           | Y           | $C_L = 15 \text{ pF}$ | 5.6 <sup>(2)</sup>       | 8.1 <sup>(2)</sup> |     | 1 <sup>(2)</sup>          | 9.5 <sup>(2)</sup> | 1          | 9.5  | ns   |
|           | G1                                   |             |                       | 5.7 <sup>(2)</sup>       | 8.1 <sup>(2)</sup> |     | 1 <sup>(2)</sup>          | 9.5 <sup>(2)</sup> | 1          | 9.5  |      |
|           | $\overline{G2A}$ or $\overline{G2B}$ |             |                       | 5.4 <sup>(2)</sup>       | 8.1 <sup>(2)</sup> |     | 1 <sup>(2)</sup>          | 9.5 <sup>(2)</sup> | 1          | 9.5  |      |
| $t_{pd}$  | A, B, or C                           | Y           | $C_L = 50 \text{ pF}$ | 7                        | 10.1               |     | 1                         | 11.5               | 1          | 11.5 | ns   |
|           | G1                                   |             |                       | 7.1                      | 10.1               |     | 1                         | 11.5               | 1          | 11.5 |      |
|           | G2A or G2B                           |             |                       | 6.8                      | 10.1               |     | 1                         | 11.5               | 1          | 11.5 |      |

(1) Product Preview

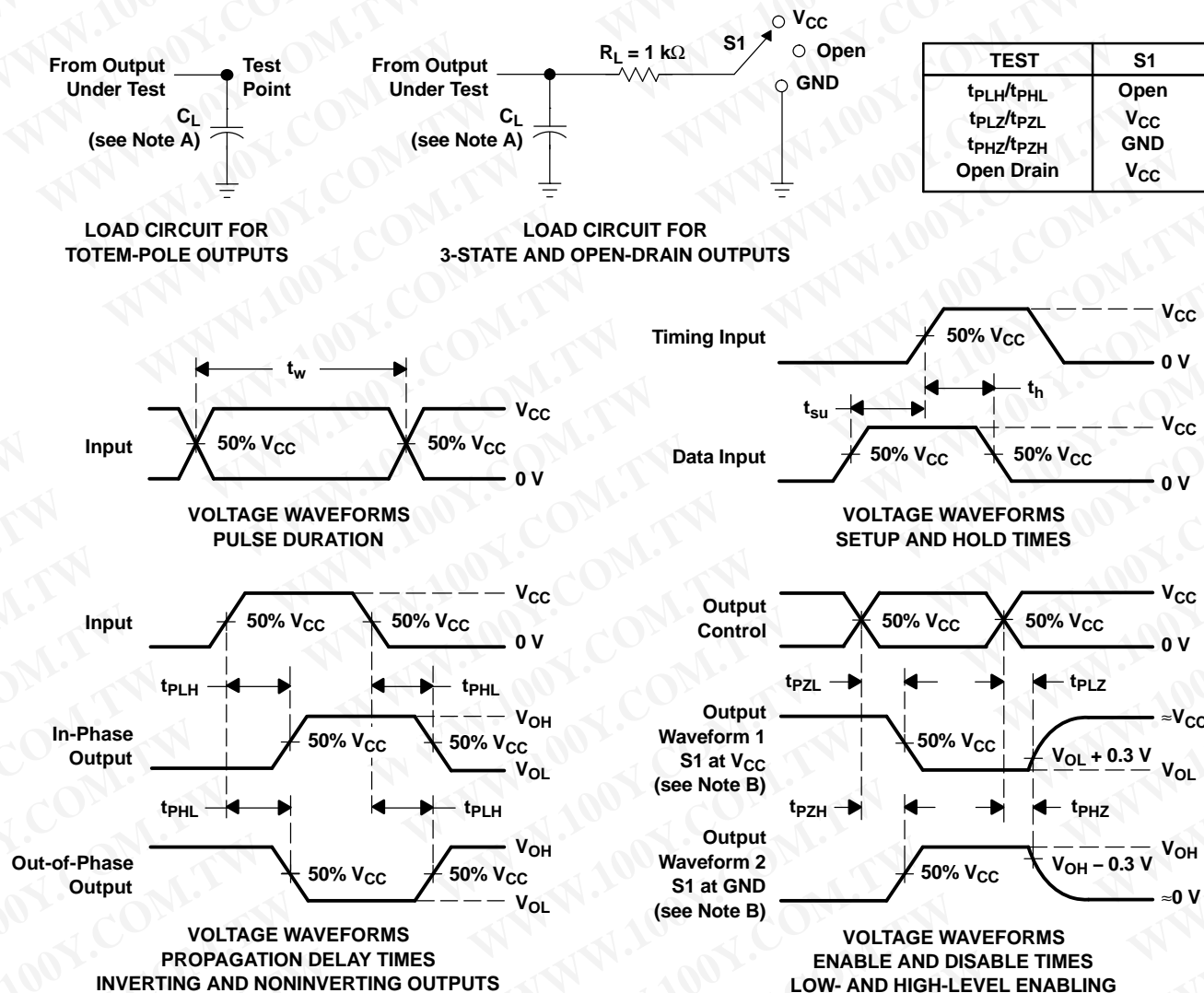
(2) On products compliant to MIL-PRF-38535, this parameter is not production tested.

### Operating Characteristics

$T_A = 25^\circ\text{C}$

| PARAMETER |                               | TEST CONDITIONS                              | $V_{CC}$ | TYP  | UNIT |
|-----------|-------------------------------|--|----------|------|------|
| $C_{pd}$  | Power dissipation capacitance | $C_L = 50 \text{ pF}$ , $f = 10 \text{ MHz}$ | 3.3 V    | 16.8 | pF   |
|           |                               |  | 5 V      | 19.1 |      |

## PARAMETER MEASUREMENT INFORMATION



- NOTES:
- $C_L$  includes probe and jig capacitance.
  - 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.
  - All input pulses are supplied by generators having the following characteristics:  $PRR \leq 1\text{ MHz}$ ,  $Z_O = 50\ \Omega$ ,  $t_r \leq 3\text{ ns}$ ,  $t_f \leq 3\text{ ns}$ .
  - The outputs are measured one at a time, with one input transition per measurement.
  - $t_{PLZ}$  and  $t_{PHZ}$  are the same as  $t_{dis}$ .
  - $t_{PZL}$  and  $t_{PZH}$  are the same as  $t_{en}$ .
  - $t_{PHL}$  and  $t_{PLH}$  are the same as  $t_{pd}$ .
  - All parameters and waveforms are not applicable to all devices.

Figure 1. Load Circuits and Voltage Waveforms



## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

### Products

|                  |  |
|------------------|--|
| Amplifiers       | <a href="http://amplifier.ti.com">amplifier.ti.com</a>             |
| Data Converters  | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>     |
| DSP              | <a href="http://dsp.ti.com">dsp.ti.com</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> |
| Low Power        | <a href="http://www.ti.com/lpw">www.ti.com/lpw</a>                 |
| Wireless         |  |

### Applications

|                    |  |
|--------------------|--|
| Audio              | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                   |
| Automotive         | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>         |
| Broadband          | <a href="http://www.ti.com/broadband">www.ti.com/broadband</a>           |
| Digital Control    | <a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a> |
| Military           | <a href="http://www.ti.com/military">www.ti.com/military</a>             |
| Optical Networking | <a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</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>             |

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2007, Texas Instruments Incorporated



**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> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN74LV138AD      | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADBR    | ACTIVE                | SSOP         | DB              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADBRE4  | ACTIVE                | SSOP         | DB              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADBRG4  | ACTIVE                | SSOP         | DB              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADE4    | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADG4    | ACTIVE                | SOIC         | D               | 16   | 40          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADGVR   | ACTIVE                | TVSOP        | DGV             | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADGVRE4 | ACTIVE                | TVSOP        | DGV             | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADGVRG4 | ACTIVE                | TVSOP        | DGV             | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADR     | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADRE4   | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ADRG4   | ACTIVE                | SOIC         | D               | 16   | 2500        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ANSR    | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ANSRG4  | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138APW     | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138APWE4   | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138APWG4   | ACTIVE                | TSSOP        | PW              | 16   | 90          | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138APWR    | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138APWRE4  | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138APWRG4  | ACTIVE                | TSSOP        | PW              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138APWT    | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138APWTE4  | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138APWTG4  | ACTIVE                | TSSOP        | PW              | 16   | 250         | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN74LV138ARGYR   | ACTIVE                | QFN          | RGY             | 16   | 1000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |
| SN74LV138ARGYRG4 | ACTIVE                | QFN          | RGY             | 16   | 1000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-2-260C-1 YEAR          |

(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.

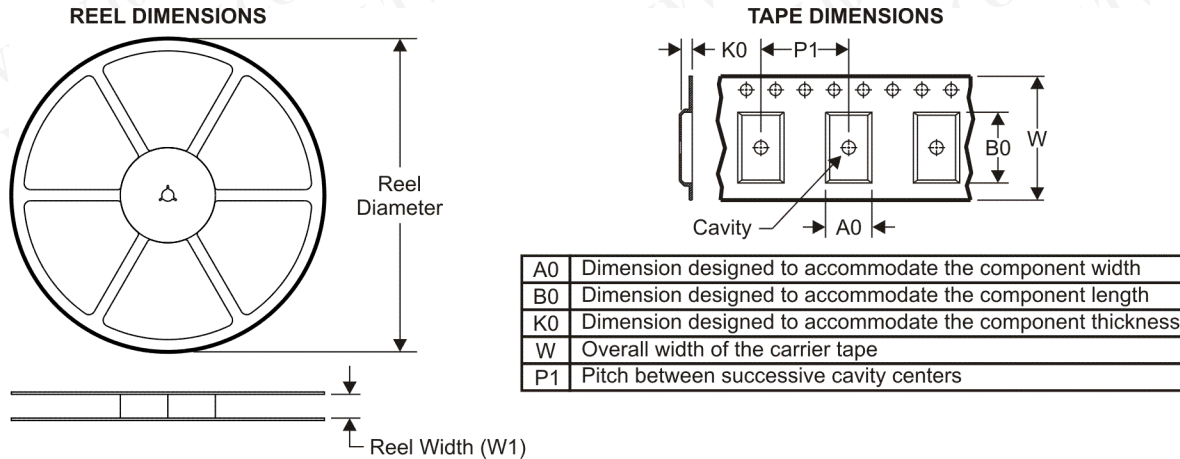
**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

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

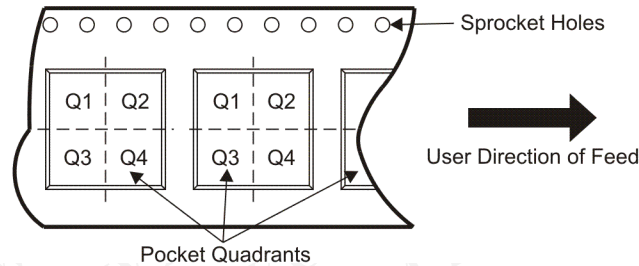
**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

**TAPE AND REEL INFORMATION**



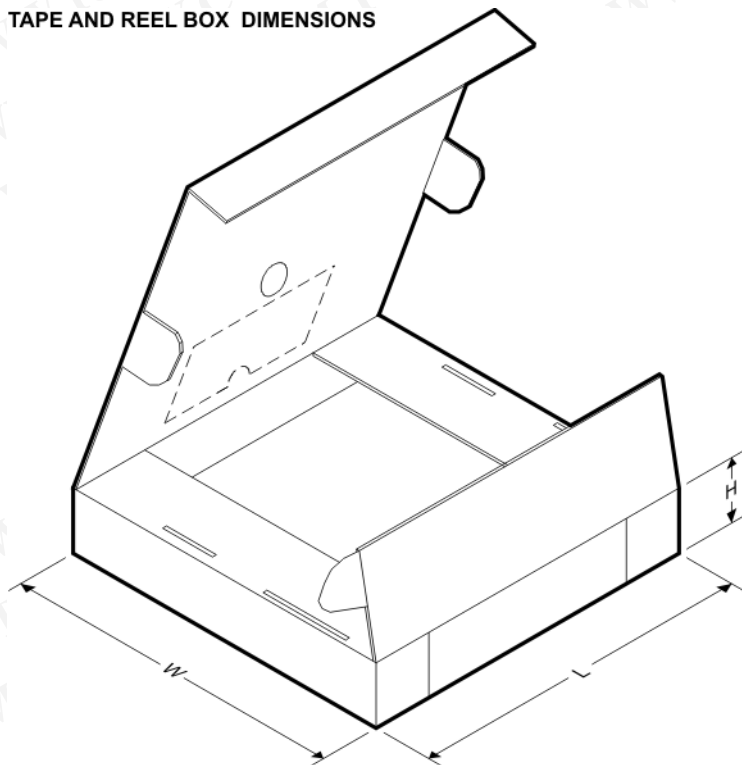
**QUADRANT ASSIGNMENTS FOR PIN 1 ORIENTATION IN TAPE**



\*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 |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN74LV138ADBR  | SSOP         | DB              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 6.6     | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LV138ADGVR | TVSOP        | DGV             | 16   | 2000 | 330.0              | 12.4               | 6.8     | 4.0     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV138ADR   | SOIC         | D               | 16   | 2500 | 330.0              | 16.4               | 6.5     | 10.3    | 2.1     | 8.0     | 16.0   | Q1            |
| SN74LV138ANSR  | SO           | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN74LV138APWR  | TSSOP        | PW              | 16   | 2000 | 330.0              | 12.4               | 7.0     | 5.6     | 1.6     | 8.0     | 12.0   | Q1            |
| SN74LV138ARGYR | QFN          | RGY             | 16   | 1000 | 180.0              | 12.4               | 3.8     | 4.3     | 1.5     | 8.0     | 12.0   | Q1            |

**TAPE AND REEL BOX DIMENSIONS**



勝特力材料 886-3-5753170  
 勝特力电子(上海) 86-21-34970699  
 勝特力电子(深圳) 86-755-83298787  
[Http://www.100y.com.tw](http://www.100y.com.tw)

\*All dimensions are nominal

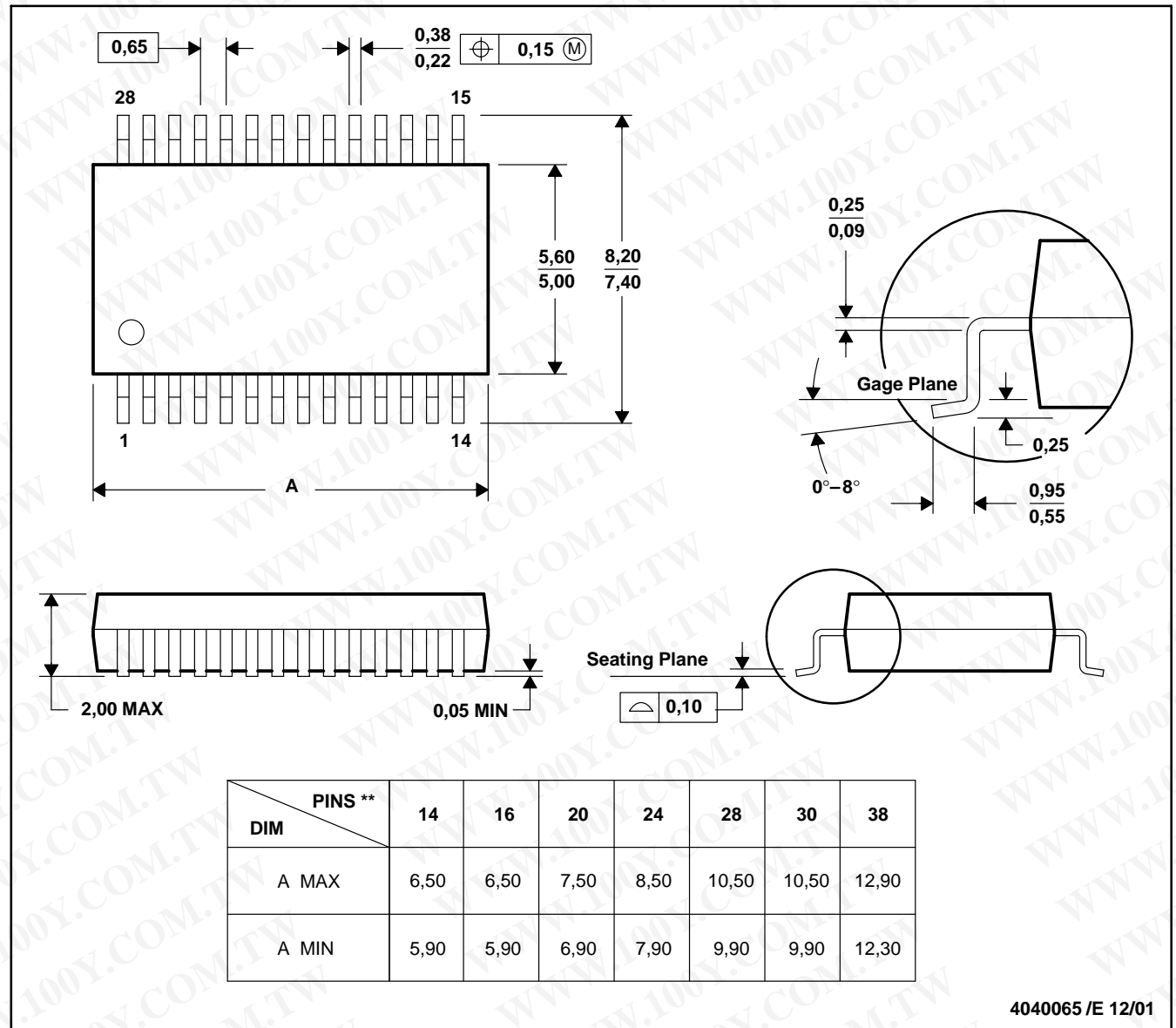
| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN74LV138ADBR  | SSOP         | DB              | 16   | 2000 | 346.0       | 346.0      | 33.0        |
| SN74LV138ADGVR | TVSOP        | DGV             | 16   | 2000 | 346.0       | 346.0      | 29.0        |
| SN74LV138ADR   | SOIC         | D               | 16   | 2500 | 333.2       | 345.9      | 28.6        |
| SN74LV138ANSR  | SO           | NS              | 16   | 2000 | 346.0       | 346.0      | 33.0        |
| SN74LV138APWR  | TSSOP        | PW              | 16   | 2000 | 346.0       | 346.0      | 29.0        |
| SN74LV138ARGYR | QFN          | RGY             | 16   | 1000 | 190.5       | 212.7      | 31.8        |



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

PLASTIC SMALL-OUTLINE

28 PINS SHOWN



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



TEXAS  
INSTRUMENTS

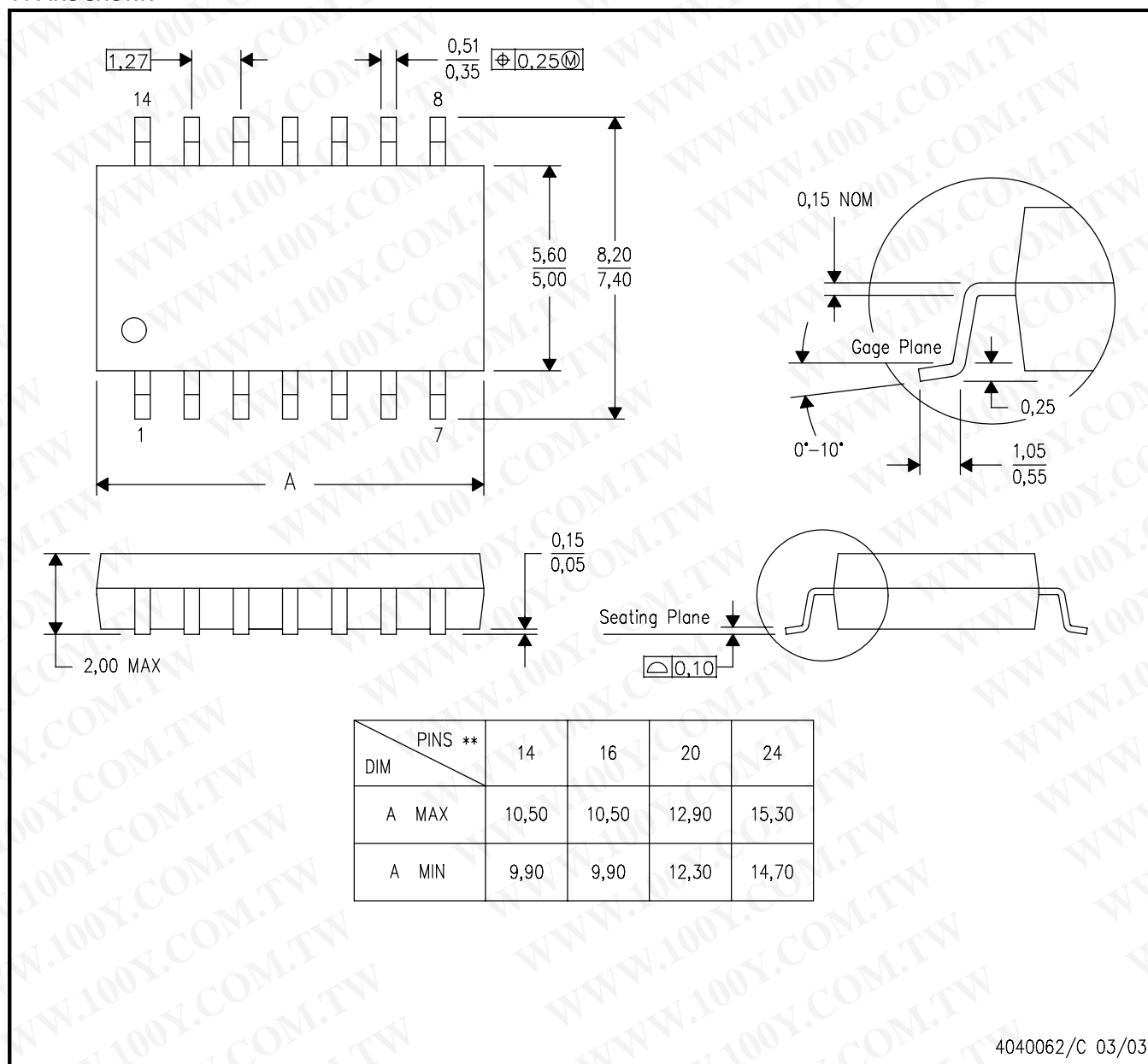
POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

## MECHANICAL DATA

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

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN

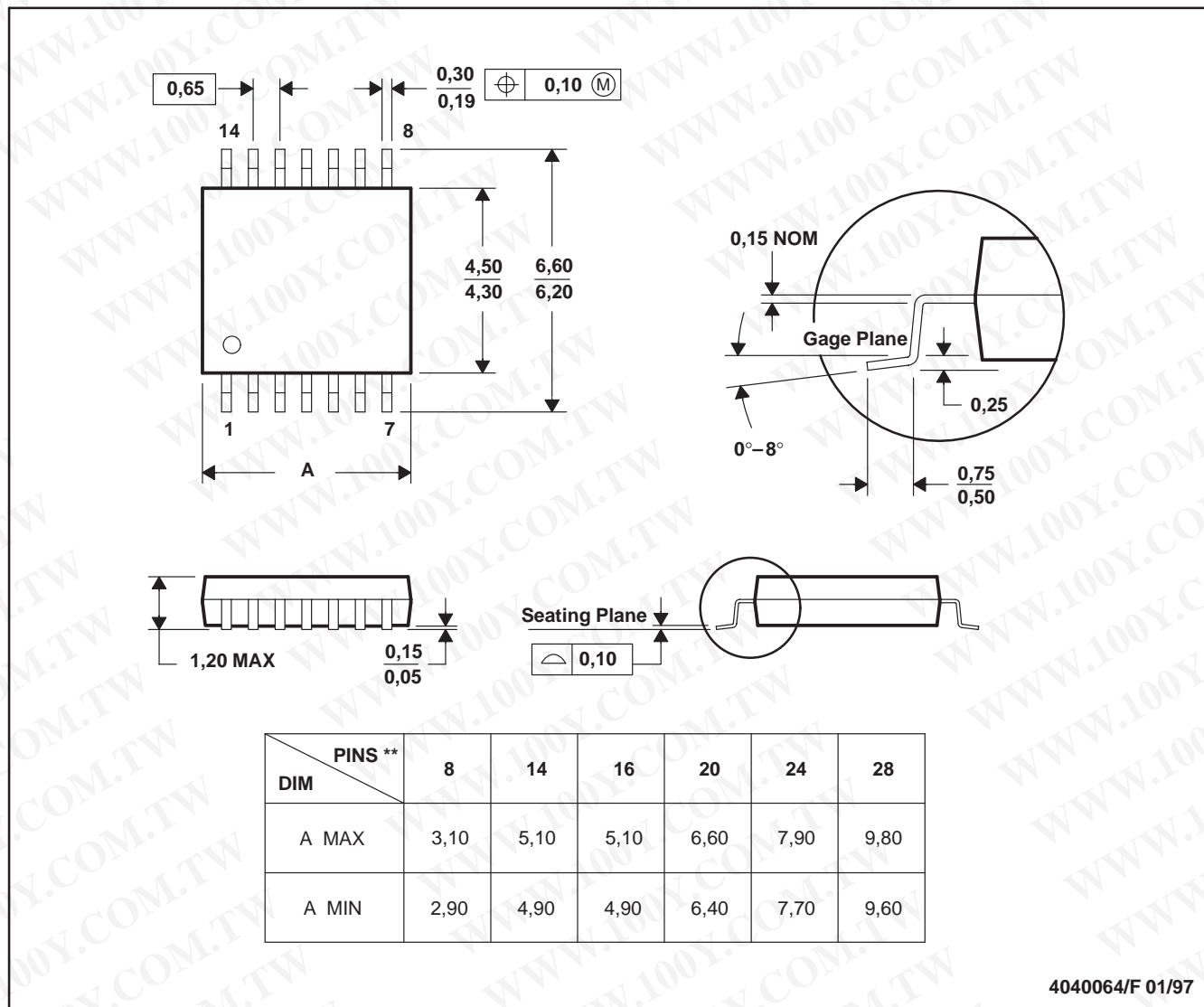


- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

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

PLASTIC SMALL-OUTLINE PACKAGE

14 PINS SHOWN



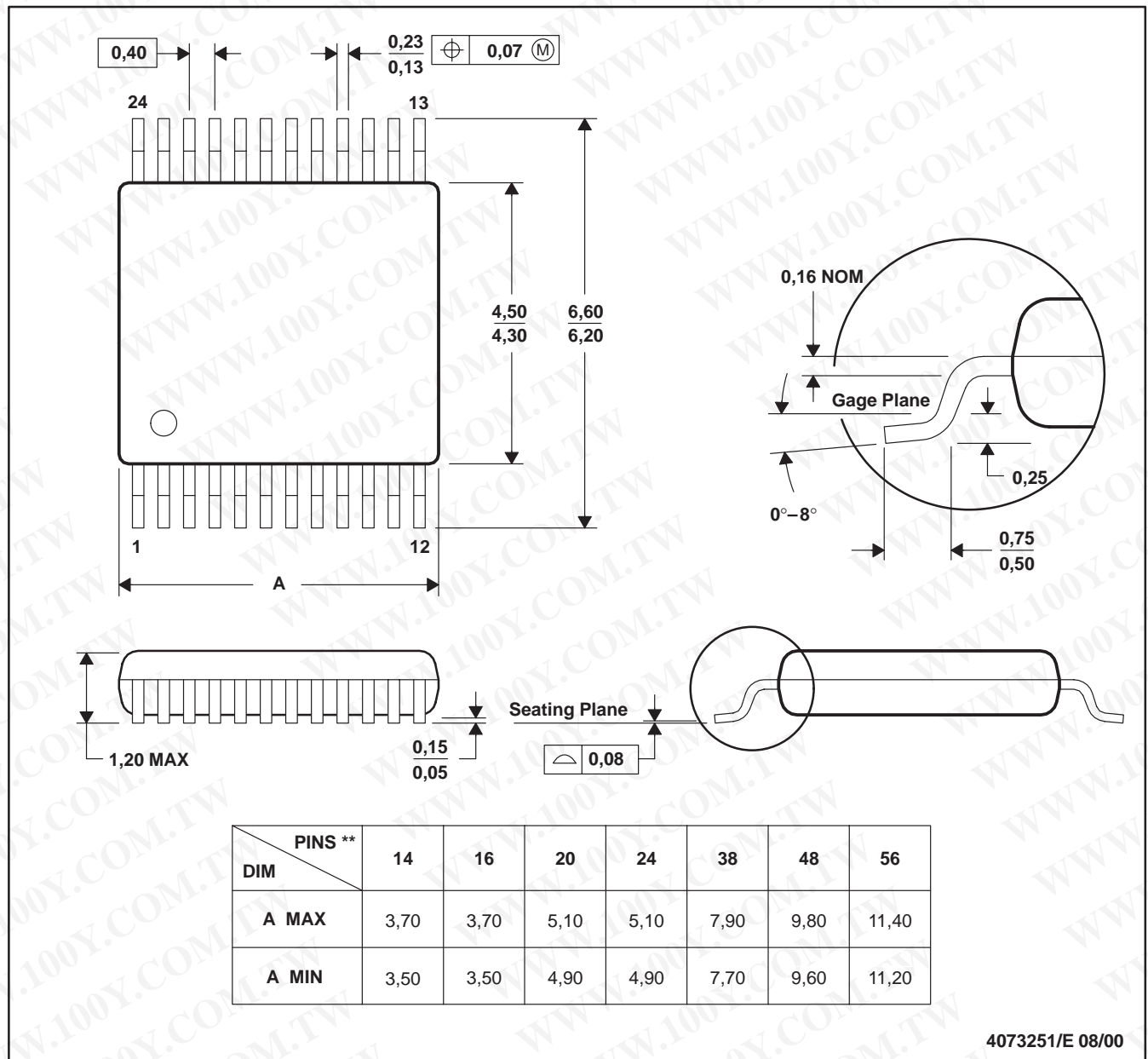
4040064/F 01/97

- 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-153

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

PLASTIC SMALL-OUTLINE

24 PINS SHOWN

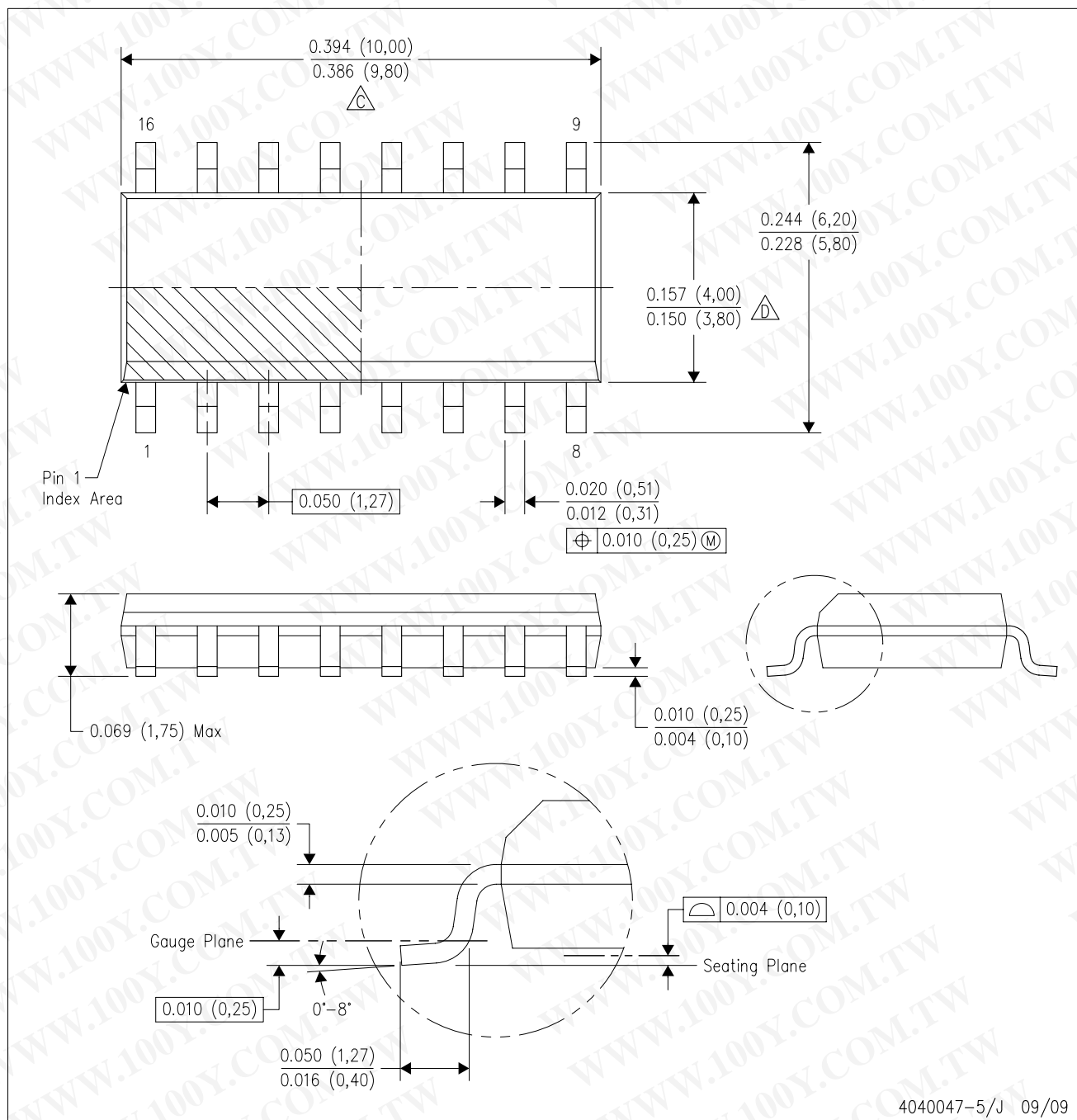


- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Body dimensions do not include mold flash or protrusion, not to exceed 0,15 per side.
  - Falls within JEDEC: 24/48 Pins – MO-153  
 14/16/20/56 Pins – MO-194



D (R-PDSO-G16)

PLASTIC SMALL-OUTLINE PACKAGE



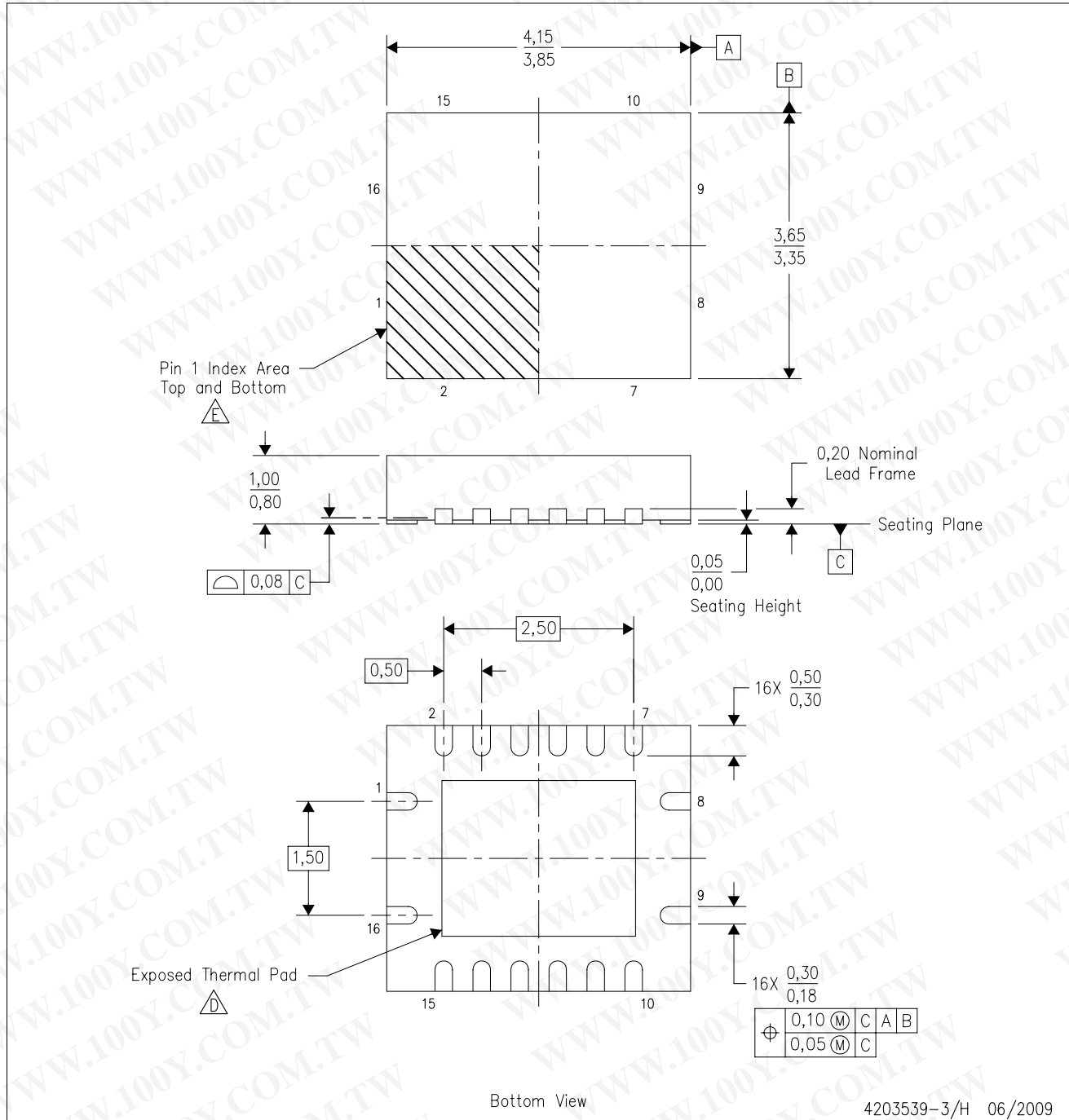
NOTES:

- A. All linear dimensions are in inches (millimeters).
- 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 .006 (0,15) per end.
- D. Body width does not include interlead flash. Interlead flash shall not exceed .017 (0,43) per side.
- E. Reference JEDEC MS-012 variation AC.

# MECHANICAL DATA

RGY (R-PVQFN-N16)

PLASTIC QUAD FLATPACK NO-LEAD



4203539-3/H 06/2009

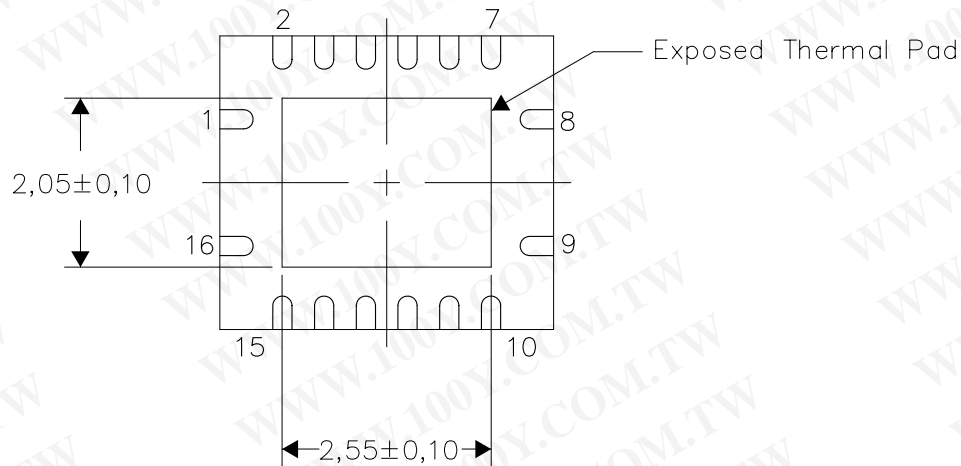
- NOTES:
- A. All linear dimensions are in millimeters. Dimensioning and tolerancing per ASME Y14.5M-1994.
  - B. This drawing is subject to change without notice.
  - C. QFN (Quad Flatpack No-Lead) package configuration.
  - The package thermal pad must be soldered to the board for thermal and mechanical performance. See the Product Data Sheet for details regarding the exposed thermal pad dimensions.
  - 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.
  - F. Package complies to JEDEC MO-241 variation BB.

## 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.

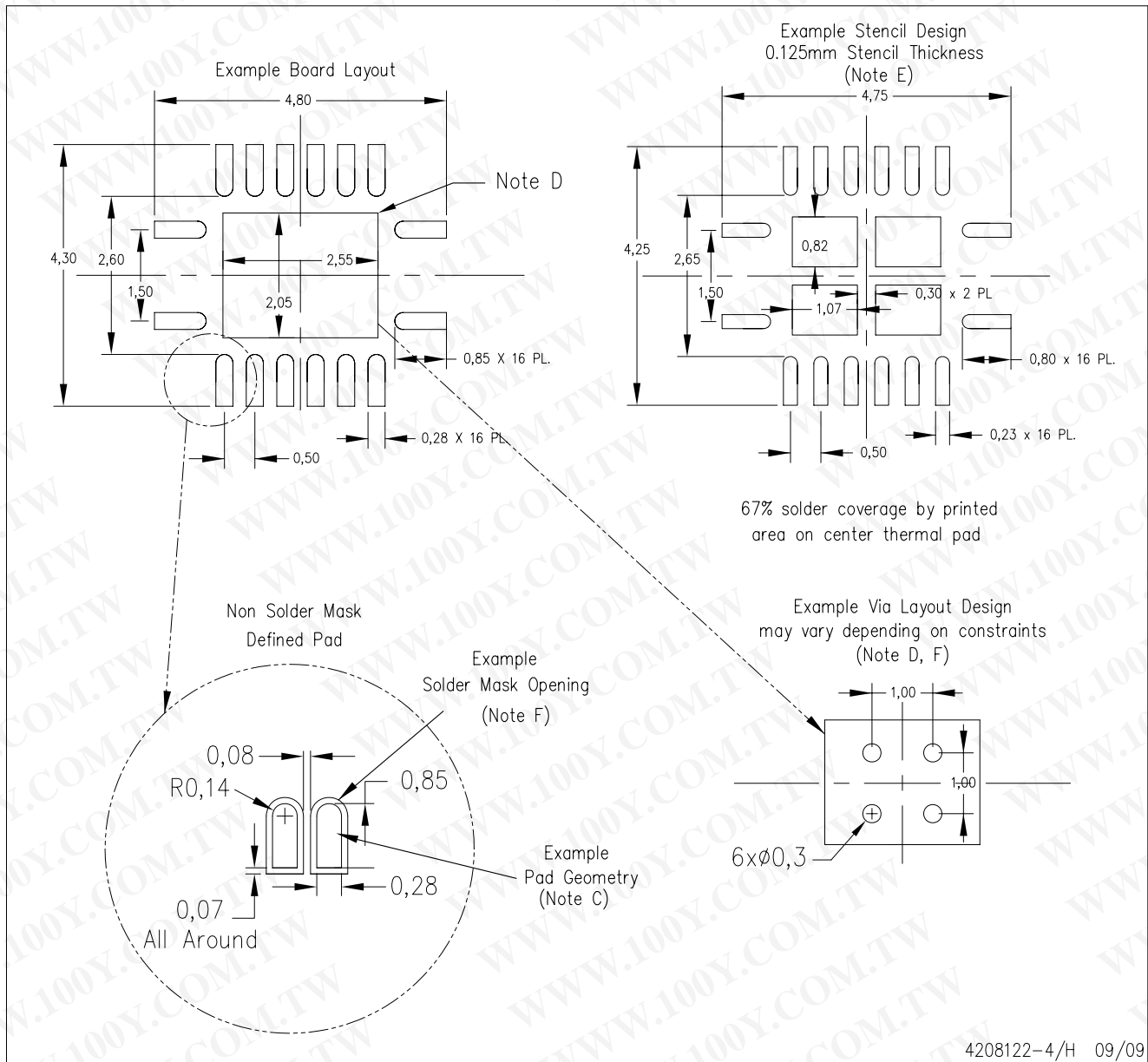


Bottom View

NOTE: All linear dimensions are in millimeters

Exposed Thermal Pad Dimensions

# RGY (R-PVQFN-N16)



4208122-4/H 09/09

- NOTES:
- All linear dimensions are in millimeters.
  - This drawing is subject to change without notice.
  - Publication IPC-7351 is recommended for alternate designs.
  - This package is designed to be soldered to a thermal pad on the board. Refer to Application Note, Quad Flat-Pack QFN/SON PCB Attachment, Texas Instruments Literature No. SLUA271, and also the Product Data Sheets for specific thermal information, via requirements, and recommended board layout. These documents are available at [www.ti.com](http://www.ti.com) <<http://www.ti.com>>.
  - 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 stencil design considerations.
  - Customers should contact their board fabrication site for minimum solder mask web tolerances between signal pads.



## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

### Products

|                             |  |
|-----------------------------|--|
| Amplifiers                  | <a href="http://amplifier.ti.com">amplifier.ti.com</a>             |
| Data Converters             | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>     |
| DLP® Products               | <a href="http://www.dlp.com">www.dlp.com</a>                       |
| DSP                         | <a href="http://dsp.ti.com">dsp.ti.com</a>                         |
| 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>               |
| RF/IF and ZigBee® Solutions | <a href="http://www.ti.com/lprf">www.ti.com/lprf</a>               |

### Applications

|                    |  |
|--------------------|--|
| Audio              | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                   |
| Automotive         | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>         |
| Broadband          | <a href="http://www.ti.com/broadband">www.ti.com/broadband</a>           |
| Digital Control    | <a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a> |
| Medical            | <a href="http://www.ti.com/medical">www.ti.com/medical</a>               |
| Military           | <a href="http://www.ti.com/military">www.ti.com/military</a>             |
| Optical Networking | <a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</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>             |

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2009, Texas Instruments Incorporated